



**MISSION ANALYSIS FOR MULTIPLE RENDEZVOUS OF NEAR-EARTH
ASTEROIDS USING EARTH GRAVITY ASSIST**

THESIS

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AFIT/GA/ENY/10-M11

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THESIS

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Abstract

The Jet Propulsion Laboratory (JPL) catalog of near-Earth objects (NEOs) such as asteroids and comets contains over 6600 asteroids and 150 comets as of February of 2010. This includes over 1000 potentially hazardous asteroids, or objects with orbits that pass close enough to Earth to pose a potential impact threat. The asteroid community believes there are a significant number of objects still undiscovered, which makes finding, tracking, and calculating missions to study these objects an active area of research. This study was based on finding orbit solutions using Earth gravity assist to visit one near-Earth object (NEO) a year for 16 years with minimal characteristic velocities for a conventional impulsive thrust propulsion system. Using a user-defined launch date, the program iterates on a number of variables to populate lists of acceptable targets and outputs key mission parameters and 3D plots of the orbits involved.

To all explorers. Whether their domains are science, philosophy, art, or any field of discovery, by examining the wonders of creation, they worship God.

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I would like to acknowledge my parents and brothers for supporting me in every endeavor I pursue; they are my biggest fans and a powerfully motivating force for me. I would like to extend a special thanks to Dr. William Wiesel who was my advisor for this work. I have immense respect for him because he is a brilliant professor and a compassionate person. I would also like to thank all of the professors and instructors at AFIT for their excellent guidance and impressive dedication to their mission of educating. I would be remiss if I did not acknowledge all of my friends and classmates who were a part of this journey; without them, it would have been much rougher and a lot less exciting! Finally, I would like to acknowledge and thank the staff at AFIT to include the education technicians, the library staff, the custodians and all else who make AFIT an efficient, clean, and wonderful place to learn.

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MISSION PLANNING FOR MULTIPLE RENDEZVOUS OF NEAR-EARTH ASTEROIDS USING EARTH GRAVITY ASSIST

I. Introduction

Motivation

The possibility of an asteroid or comet striking the Earth is a very real threat. The space community tracks thousands of objects and there are potentially undiscovered thousands. This creates what many call an interstellar “shooting gallery” within which the Earth continually travels. William Napier, in the article *Hazards from Comets and Asteroids* (as cited in Bostrom, and, Cirkovic, 2008) writes, “Multiplying the low probability of an impact by its large consequences, one finds that the per capita impact hazard is at the level associated with the hazards of air travel and the like. Unlike these more mundane risks, however, the impact hazard is unbounded: a big one could end civilization (2008: 234).” The rate of discovering new objects is somewhat alarming as well. Napier writes, “The rate of discovery of Earth-crossers has been impressive, going from 350 in 1995 to 3400 a decade later – of which about 800 are thought to be a kilometer or more in diameter...It is generally thought that the total population of near-Earth asteroids over a kilometer across is about 1100 (2008: 226).” He goes on to say that this equates to an estimated impact of around one in every 500,000 years and that an impact of an object over a kilometer or two would result in the end of civilization. McCrea writes (as cited in Bostrom, and, Cirkovic, 2008) that the largest craters on Earth are estimated to be the result of impact objects that release energy levels equivalent to, “...100 million megatons TNT, or about 10 atomic bombs of Hiroshima size on each square kilometer of the Earth’s surface (1981).” Napier says that this energy is released

in seconds and spreads around the globe on timescales measured in hours (2008: 225). Because of the potential consequences of an impact, it behooves all of society to gain as much knowledge as possible about these objects and their orbit characteristics to aid in possibly defending against such threats. It is difficult to estimate from observatories on Earth the key object characteristics that are pivotal for planning an impact defense, such as size, density, and shape. Because of this, it is critical to send robotic probes or even human missions to such objects to gather this needed data and to expand our knowledge about this threat.

There are many papers written outlining multiple rendezvous of asteroids, but many rely on less understood propulsion techniques rather than conventional chemical thrust devices. Many also use very complicated orbit maneuvers that require computationally challenging techniques that are prone to errors. This research work concentrates on keeping the rendezvous mechanics simple and fuel usage minimal to allow for years of gathering data about multiple asteroids. The research utilizes data collected by JPL of the thousands of near-Earth objects (NEOs) that could lend itself to such spacecraft missions. As mentioned, the asteroid community believes there are a significant number of objects still undiscovered, which makes finding, tracking, and calculating missions to study these objects an active area of research. This study was based on finding orbit solutions using Earth gravity assist to visit one space object a year for 16 years. Using a user-defined launch date, the program iterates on a number of variables to populate lists of acceptable targets and outputs key mission parameters and three-dimensional plots of the orbits involved. Instituting such a 16-year mission would

more than pay for itself from the value of the knowledge gained and could potentially have an immeasurable return on investment (ROI) if it aided in the discovery and prevention of a civilization-ending impact.

Problem Statement

There are thousands of NEOs and many decision variables involved that change the potential orbital mechanics. This creates a solution space that requires approximately $N!$ (factorial) calculations. With N in this case being over 6000, the calculations that are required to search the entire solution space are truly astronomical. The easiest way to handle this is to invoke enough constraints to make the problem more manageable. In this research, the main question to ask is how to visit one NEO a year for 16 consecutive years with only utilizing small velocity change maneuvers in deep space. Another constraint is requiring the magnitude of the transfer velocity vector to be approximately equal to the magnitude of Earth's velocity vector. This constraint is important because it virtually guarantees the transfer periods to potential asteroids to be equivalent to the orbital period of the Earth. If this happens, the spacecraft will return with the Earth in almost the same location as when the transfer trajectory started. This has the added bonus of minimizing the characteristic velocity required to gain the Earth's gravity assist. Finally, only two-body orbital mechanics are considered. This is the basic problem statement for this research. The following sections outline the details required to address this problem more completely.

Research Objectives

The objective of this research was to investigate the solution space with a given launch date to see if at least one asteroid or comet solution was available for each year from 2010 to 2025. The major constraint is that the spacecraft would only undergo one deep space maneuver (DSM), which would set the spacecraft up to use Earth's gravity to turn its incoming velocity vector into that required for a transfer trajectory to another object.

Research Focus

The work presented here focused on studying the two-body equations of motion for finding proof-of-concept solutions within the asteroid/comet catalogs developed and maintained by the Jet Propulsion Laboratory (JPL). A more robust analysis would numerically integrate the N-body affects of the major planets to see their effect on perturbing the transfer orbits, but this is something for follow-on research to tackle.

This research also focused on using conventional spacecraft propulsion technologies, which include chemical-based impulsive thrust devices. Even though devices such as ion thrusters and pulsed plasma devices are maturing, this author feels that the orbit community currently has more knowledge and familiarity with chemical impulsive thrust devices. Finding solutions with this approach leads to a quicker timeline for possible missions since one does not have to wait for the propulsion technology to catch up to the orbital mechanics theory.

II. Literature Review

Below are research papers that setup many of the concepts used in this research. The discussion focuses on their approach to the problem and the applicability to this research. The headings are the titles of the papers of interest. The section concludes with some suggested papers for the interested reader.

Design and optimization of Trajectory to Near-Earth Asteroid for Sample Return Mission Using Gravity Assists

Xu, Cui, Qiao, and Luan wrote about their research on this topic in 2007 and it is relevant because they too look at multiple asteroid rendezvous utilizing Earth gravity assist (EGA) and DSMs to accomplish this goal. They also approach the problem utilizing conventional impulsive thrust propulsion systems and utilize data presented from the JPL website for locating the asteroids of interest. The major difference in their research is that they do not include the one-year trajectory period constraint, nor do they limit the number of EGAs. For instance, they look at harmonic EGAs, such as 2:1(\pm), which means that the Earth will go through 2 orbits around the sun and the spacecraft will go through 1 orbit before it rendezvous with the object of interest. The \pm indicates whether or not the spacecraft approaches the Earth after or before the spacecraft passes the line of apsides. Below is an adapted table of their results (2007:224).

Table 1: Solutions for the difference method

	Initial design parameters	The optimal solution with EA
Launch Time	6/13/2007	6/10/2007
Flyby 16490	12/27/2007	12/28/2007
Flyby min-D (km)*	1750	1652
DSM date	6/12/2008	6/12/2008
Flyby 11300	8/27/2008	8/27/2008
Flyby min-D (km)*	2100	1890
Swingby date	5/24/2009	5/24/2009
Rendezvous date	7/20/2010	7/25/2010
Total ΔV (km/s)	5.465	5.284
Flight time (days)	1133	1140
*Flyby min-D (km) indicates the minimum distance at asteroid flyby		
** EA is Earth Assist		

The equations and approach used in this research are similar to those utilized by these authors except for some of the constraints used. Later sections will outline the constraints of this research.

Optimal Trajectory Generation for Multiple Asteroid Rendezvous

Koeppel wrote about his research on this topic in 2007 and is relevant because it too attempts searches for optimal trajectories to multiple asteroids. He also utilizes MATLAB for dynamic optimization of the problem and appears to also use the JPL NEO website to generate the asteroid ephemerides. His results also include three-dimensional plots of the Sun, Earth, the asteroid's orbit, and the spacecraft's trajectory, but since he analyzes a low-thrust device, the spacecraft takes on spiral trajectories. The major difference is that he uses constant, low-thrust propulsion on which to base the orbit mechanics involved. Because of this, he has to numerically integrate the equations of motion in order to keep track of the spacecraft's position, velocities, and accelerations with respect to time. He also did not concern himself with the timeframe constraint of one year as is done in this research. This is a good resource for ideas if solving multiple

asteroid rendezvous utilizing a constant thrust device, but is too different to offer much insight into the problem as constrained in this research.

Mission Planning for Close-Proximity Satellites

Witt wrote about his research on this topic in 2009 and is relevant because it uses p-iteration code to solve the Gauss problem, which is also a problem analyzed in this research. He analyzes the case of having a conventional impulsive thrust propulsion system and utilizes the two-body equations of motion for his orbits. The main difference is that he looks at multiple rendezvous of Earth-based spacecraft as his trajectory goal. His focus is, therefore, within the Earth's gravity well as opposed to interplanetary flight, which is the focus of this research.

Spacecraft Trajectory Design For Tours of Multiple Small Bodies

Barbee, Davis, and Hur-Diaz wrote about this research in 2009 and it is relevant because their goal is also to rendezvous with many different asteroids within a desired timeframe. They also utilize the JPL NEO website to provide the asteroid ephemeris data. Similarly to Koeppel, they did their research as part of the annual Global Trajectory Optimization Competition (GTOC). The European Space Agency's Advanced Concepts Team organized the first GTOC in 2005 and the competition has since become something that the winner of each organizes for the next year (Dunbar, 2007: n.pag.). Again, the main difference is that their research utilizes low, constant thrust propulsion to visit multiple asteroids in series before returning to Earth. Their spacecraft has an estimated I_{sp} of 3000 seconds, a dry mass of 500 kg, and an overall mass of 1500 kg. They show their results in a very concise way, which is adapted in Table 2 below (2009:18).

Table 2: GTOC4 Asteroid Itinerary and Spacecraft Mass Evolution

Asteroid	Segment Type	Time (MJD)*	Date**	Spacecraft Mass (kg)	Δm (kg)**	ΔV (m/s)**
162173	Flyby	59224	30-Jan-21	1500.000	-	-
140158	Flyby	59353	8-Jun-21	1436.279	63.721	3529.0
2008EE9	Flyby	59443	6-Sep-21	1387.355	48.924	2746.4
1983LC	Flyby	59489	22-Oct-21	1372.457	14.898	863.8
2000QV7	Flyby	59591	1-Feb-22	1312.762	59.695	3318.1
2003JO14	Flyby	59703	24-May-22	1265.080	47.682	2679.8
2007YF	Flyby	59808	6-Sep-22	1238.010	27.070	1551.2
2006RJ1	Flyby	59894	1-Dec-22	1204.406	33.604	1913.7
2001SY169	Flyby	59964	9-Feb-23	1200.832	3.574	209.5
2003GX	Flyby	60033	19-Apr-23	1180.349	20.483	1181.2
2005YP180	Flyby	60112	7-Jul-23	1156.602	23.747	1365.1
2003LH	Flyby	60203	6-Oct-23	1147.390	9.212	537.1
22753	Flyby	60306	17-Jan-24	1139.755	7.635	445.8
1991FB	Flyby	60378	29-Mar-24	1133.069	6.686	390.8
2005BG28	Flyby	60488	17-Jul-24	1090.918	42.151	2381.2
2007XH16	Flyby	60600	6-Nov-24	1076.019	14.899	863.9
153002	Flyby	60720	6-Mar-25	1019.515	56.504	3149.9
2003YG136	Flyby	60777	2-May-25	972.617	46.898	2637.6
2007VB138	Flyby	60874	7-Aug-25	956.146	16.471	953.5
2007DJ8	Flyby	60988	29-Nov-25	946.000	10.146	591.0
2008GF1	Flyby	61048	28-Jan-26	915.642	30.358	1734.1
2004FD	Flyby	61119	9-Apr-26	907.265	8.377	488.8
1994WR12	Flyby	61225	24-Jul-26	893.045	14.220	825.0
2008EL85	Flyby	61338	14-Nov-26	883.581	9.464	551.7
2001BA16	Flyby	61452	8-Mar-27	863.138	20.443	1178.9
2004KZ	Flyby	61568	2-Jul-27	847.591	15.547	900.9
2007CR5	Flyby	61659	1-Oct-27	790.146	57.445	3199.6
2008TP26	Flyby	61711	22-Nov-27	776.823	13.323	773.7
2005XN27	Flyby	61823	13-Mar-28	768.677	8.146	475.4
2005UH6	Flyby	61937	5-Jul-28	757.828	10.849	631.5
1998DK36	Flyby	62025	1-Oct-28	748.300	9.528	555.4
175706	Flyby	62097	12-Dec-28	722.532	25.768	1478.4
4769	Flyby	62178	3-Mar-29	698.908	23.624	1358.2
2008TS26	Flyby	62244	8-May-29	684.545	14.363	833.2
175729	Flyby	62360	1-Sep-29	677.364	7.181	419.5
2000SZ162	Flyby	62480	30-Dec-29	659.040	18.324	1058.9
141851	Flyby	62537	25-Feb-30	651.134	7.906	461.6
2001UO	Flyby	62611	10-May-30	636.500	14.634	848.7
1997US2	Flyby	62657	25-Jun-30	630.486	6.014	351.8
2005CN	Rendezvous	62781	27-Oct-30	581.300	49.186	2760.5
* MJD found by subtracting 2400000.5 from the Julian Date				Total	918.7	52194.4
** Added column						

One goal of this research is to similarly tabulate results to more concisely communicate the intent of the research to the reader.

Suggested Reading

1. Analysis of V_∞ Leveraging for Interplanetary Missions

- Written by Sims, and Longuski in 1994, this research explores the idea of EGA harmonics in visiting the interior planets (those closer to the Sun than the Earth) and also how they might be used to visit the outer planets. They also outline the mathematics involved for the problem and provide vector diagrams for the velocities involved and how they change via an EGA.

2. V_∞ Leveraging for Interplanetary Missions: Multiple-Revolution Orbit Techniques

- Written by Sims, Longuski, and Staugler in 1997, this research outlines, in detail, the mathematics used for EGAs and shows some results of their application to orbit rendezvous.

3. Optimization of ΔV Earth-Gravity-Assist Trajectories

- Written by Casalino, Colasurdo, and Pastrone in 1998, this research takes the approach outlined in Sims et al. and expands on some of the mathematics for EGAs.

4. Minimum-Fuel Escape from Two-Body Sun-Earth System

- Written by Colasurdo and Casalino in 1999, this research expands on their 1998 paper by looking at more EGA harmonic combinations and the resulting possible orbit distances.

5. Simple Strategy for Powered Swingby

- Written by Casalino, Cloasurdo, and Pastrone in 1999, this research explores the geometry for a planetary flyby, the turning angle, and the energy involved. It also looks at the velocities involved inside and outside of the SOI for the planet of interest.

6. Evaluating Accessibility of Near-Earth Asteroids via Earth Gravity Assists

- Written by Qiao, Cui, and Cui in 2006, this research is the precursor to their work in 2007 outlined above. It describes some of the mathematics used in harmonic EGAs and they produce a concise table comparing the results of their approach to that of other authors.

7. Optimization of Interplanetary Trajectories for Impulsive and Continuous Asteroid Deflection

- Written by Izzo in 2007, this paper is not entirely applicable since it focuses on trying to change the orbit of a desired asteroid, but it does have some good discussion about asteroid characteristics and their orbit properties. It is an interesting read, however, since it approaches the problem of defending against potentially hazardous asteroids.

No one paper or research was found that approaches the multiple asteroid rendezvous problem the same as shown in this research. However, this research does use concepts outlined in many of the papers above. One is encouraged to read these sources if interested in this topic and desire more background information for some of the concepts involved.

III. Methodology

Orbit Basics

The problem of finding asteroids, planning a mission to visit one, and iterating to find low-energy follow-on trajectories begins by having a basic understanding of orbital mechanics. The first thing to consider is that all objects in the solar system are subject to the law of gravitation, which says that any object containing mass will be drawn to any and all other objects that have mass. Taken to the extreme, this says that there is a gravitational attraction between a piece of sand on Earth and a particle on Mars. For practical approaches, one takes on a macroscopic perspective, which considers objects to be point masses. The major players for orbit mechanics are the Sun and the planets. All the smaller objects are drawn more to either the Sun or the planets depending on which Solar System body is closest. A later section on a body's sphere of influence (SOI) will explore this idea in detail.

The law that governs the gravitation between objects is a form of Sir Isaac Newton's (1642-1727) classic equation relating a force to acceleration through its mass:

$$\mathbf{F} = m\mathbf{a} \tag{1}$$

Where \mathbf{F} is *force*, m is *mass*, and \mathbf{a} is *acceleration* (Wiesel, 1997: 24). The bold indicates that the variable is a vector, or that it contains information regarding the direction of the quantity. Rearranging equation 1 and accounting for gravity and the distance between the two objects yields the gravity force between them as shown in equation 2. *Spaceflight Dynamics* by Wiesel outlines the details of this derivation (1997: 26):

$$\mathbf{F}_g = \frac{Gm_1m_2}{r^2} \frac{\mathbf{r}}{r} \quad (2)$$

Here, G is the *universal gravitational constant* and r is the *distance* between the objects. G is approximately equal to $6.6695 \times 10^{-11} \text{ N} \cdot \text{m}^2/\text{kg}^2$ (Wie, 2008: 222). The bold \mathbf{r} over r indicates a unit vector in the direction of the gravity force. A unit vector simply indicates a direction and has a magnitude equal to one.

With an understanding of the gravitational force between bodies in the solar system, it is useful to look at Kepler's laws, which add further understanding of the basic orbit mechanics problem. Johannes Kepler (1571-1630) observed the motions of the planets and came up with relationships that Newton later refined utilizing his mechanics methods (Roddy, 2006). Kepler's first law states that the orbits of the planets are elliptical with the Sun being at one of the foci. His second law states that a planet will sweep out equal areas for equal timeframes of its orbit plane. This means that when a satellite is closer to the body it orbits, it moves faster and slower when it is farther away. Throughout this paper, the term *satellite* will be used as any object orbiting a body. Therefore, in some contexts, it will mean a planet, in others a human-made orbiting object, and other times it could mean an asteroid or comet. Kepler's third law states that,

“...the square of the periodic time of orbit is proportional to the cube of the mean distance between the two bodies (Roddy, 2006: 31).” In simple terms, this means that the motion of a satellite is proportional to the orbit’s size as shown in equation 3 (Vallado, 1997: 113).

$$n = \sqrt{\frac{\mu}{a^3}} \quad (3)$$

Here, n is *mean motion* in radians per second, a is the *semimajor axis* of the orbit, and μ is the *gravitational constant* of the body being orbited and is equivalent to the product of the universal gravitational constant and the body’s mass. The μ values used in this research are $3.986005 * 10^{14} \text{ m}^3/\text{s}^2$ for Earth (Wertz, 1997: 819) and $1.32712440018 * 10^{20} \text{ m}^3/\text{s}^2$ for the Sun (www.planck.com). In lieu of the product of G and a body’s mass, calculations use the body’s gravitational constant because its measurement is more accurate when compared to finding a body’s mass.

Having the basics outlined by Kepler and Newton allows one to approach the types of orbits possible for a satellite. If one slices a right cone in different ways, the result is the basic orbit shapes called conic sections. Figure 1 shows these (Mendez, 2000).

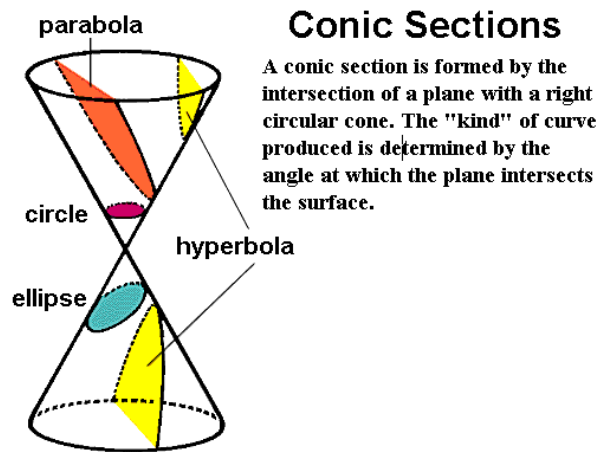


Figure 1: Conic Sections

These shapes, when applied to orbits, are quantified by the term *eccentricity*, e . Table 3 shows the values that eccentricities take on and the associated shape.

Table 3: Orbit Shapes and Eccentricities

e	Orbit Shape
0	Circle
1	Parabola
$0 < e < 1$	Ellipse
$1 < e$	Hyperbola

Because the bulk of analysis in this research deals with elliptical orbits, further attention is given to understand some of the nomenclature and mathematical relationships for this type of orbit. As mentioned above, the semimajor axis describes the size of an orbit and figure 2 shows how it is measured in the orbit plane.

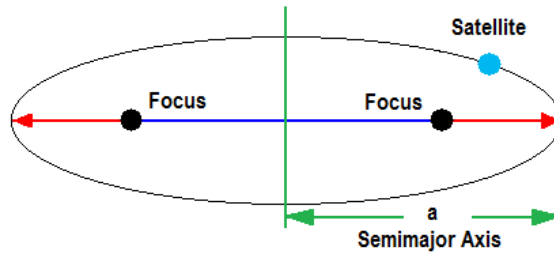


Figure 2: Semimajor Axis

To locate a satellite in its orbit, one needs to know the point at which the satellite passes closest to a focus and then the point when it is farthest away from the same focus. These locations are the *periapsis*, r_p , and *apoapsis*, r_a , of the orbit respectively. The line connecting these two points, called the *apse line*, defines the eccentricity vector direction. One can also think of this line as a centerline because the orbit mirrors itself above and below this line. Figure 3 shows all of these concepts.

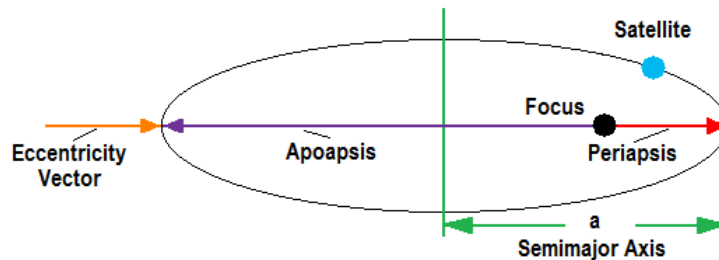


Figure 3: Apse Line

The final step in identifying the satellite in its orbit is to define an x and y-axis, which is along the apse line and perpendicular to it respectively. From the x-axis, draw an angle counterclockwise to the line connecting the focus and the satellite, r . This angle is called *true anomaly*, θ . Two other quantities useful for calculating orbit parameters are

the *semiminor axis*, b , which is the maximum height of the ellipse along the y-axis and the *semilatus rectum*, p , which is the distance from the focus to the ellipse along the y-axis. All of these quantities form the *perifocal frame*, or the frame that defines the orbit of the satellite in two dimensions around the body at one of the foci. Figure 4 represents this frame.

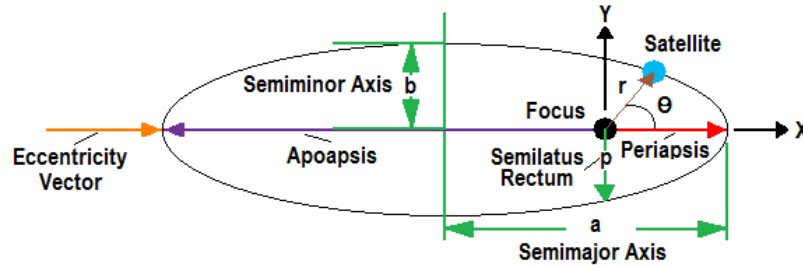


Figure 4: Perifocal Frame

Shown below are all of the equations relating these quantities (Wiesel, 1997: 55-59).

$$p = a(1 - e^2) \quad (4)$$

$$r = \frac{p}{1 + e \cos \theta} \quad (5)$$

$$r_p = a(1 - e) \quad (6)$$

$$r_a = a(1 + e) \quad (7)$$

$$b = a\sqrt{1 - e^2} \quad (8)$$

$$a = \frac{r_p + r_a}{2} \quad (9)$$

As one can see, some basic knowledge about the orbit is required in order to calculate many of these quantities. Typically, one will know the periapsis distance and

the eccentricity. With these, computation of all the other quantities is possible. To put the position of the satellite in vector form in the perifocal coordinate frame, one can use the following (Wiesel, 1997: 65):

$$\mathbf{r} = r \begin{bmatrix} \cos \theta \\ \sin \theta \\ 0 \end{bmatrix} \quad (10)$$

The following gives the velocity in vector form (Wiesel, 1997: 66):

$$\mathbf{v} = \sqrt{\frac{\mu}{p}} \begin{bmatrix} -\sin \theta \\ e + \cos \theta \\ 0 \end{bmatrix} \quad (11)$$

Utilizing these two quantities, one can find the vector form of the angular momentum as shown below (Wiesel, 1997: 62).

$$\mathbf{h} = \mathbf{r} \times \mathbf{v} \quad (12)$$

If one expands out the cross product, the result is the following

$$\mathbf{h} = \begin{bmatrix} 0 \\ 0 \\ (r_x v_y) - (r_y v_x) \end{bmatrix} \quad (13)$$

where r_x and r_y are the distances away from the origin along the x-axis and y-axis respectively. Similarly, v_x and v_y are the velocities along the x-axis and y-axis respectively. One can see that the angular momentum vector has no components along the plane defined by the x and y axes since it is perpendicular to this plane.

Some other valuable quantities describing the orbit are now possible. Shown below is the *orbital period*, T , or the time the satellite takes to complete one revolution. ϵ is the *energy* of the satellite and H is its *angular momentum*, which are both constant throughout the orbit (Wiesel, 1997: 56):

$$T = 2\pi \sqrt{\frac{a^3}{\mu}} \quad (14)$$

$$H = \sqrt{\mu p} \quad (15)$$

$$\varepsilon = -\frac{\mu}{2a} \quad (16)$$

All of these equations contribute to understanding the orbit of the object of interest. The next step is to build on this two-dimensional case and gain an understanding of the three-dimensional aspects of an orbit.

Finding the Planets and Asteroids

The first thing to establish for the three-dimensional case of orbit mechanics is a frame of reference, or a starting point, in which to relate distance and velocity values. Because this problem deals with asteroids, it is convenient to utilize the Sun-centered reference frame. Also called the *heliocentric reference frame*, this puts the sun at the center of the frame and all measurements refer back to this point. The goal of this section is to locate the perifocal frame of the orbiting object within the heliocentric system. To start, one finds the X-axis of this system. To make calculations easier, one uses an inertial frame, which means that the frame has no relative motion or accelerations. To accomplish this, the heliocentric system's X-axis is defined by the first point of Aries, which is a point in space so far away that it appears relatively stationary throughout time (Roddy, 2006: 67). The system's Y-axis is then 90 degrees away from the X-axis along the Sun's equator plane. The Z-axis completes the frame by being orthogonal (perpendicular) to the plane created by the X and Y axes (Vallado, 1997).

Having established the frame, one can now define angles that enable one to locate the perifocal frame outlined above. As the satellite moves along in its orbit, there is a point, called the *descending node*, where it will go from being above the ecliptic plane to below it. At some point later in time, the satellite will move from being below the ecliptic plane to above it, which is the *ascending node*. The line connecting these points is the *line of nodes*. One locates the line of nodes by defining an angle, the *longitude of the ascending node*, Ω , measured from the heliocentric X-axis. The next angle, *inclination*, i , helps define how the perifocal frame is inclined compared to the ecliptic plane. One measures inclination from the Z-axis of the ecliptic to the angular momentum vector of the satellite's orbit. To finish identifying the orientation of the perifocal frame within the heliocentric frame, one needs one more angle, the *argument of periapsis*, ω . One measures the argument of periapsis from the line of nodes to the eccentricity vector within the perifocal plane. From this point, one locates the satellite by using the equations for the perifocal plane outlined above. Figure 5 shows these concepts graphically (Petty, 2002).

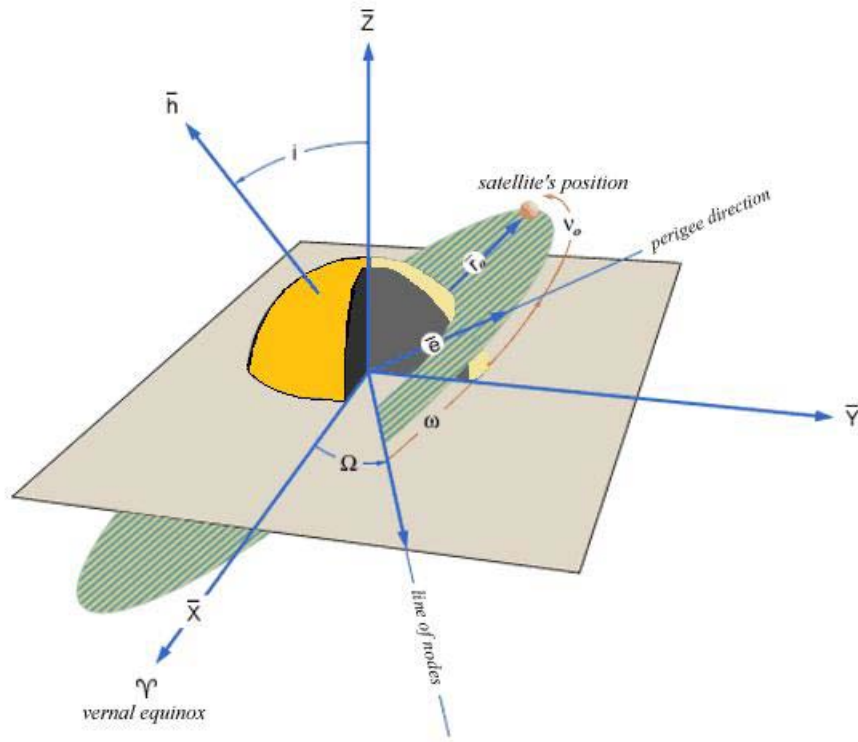


Figure 5: Orbital Elements

Using the angles described above, one is able to transform vectors in the perifocal frame into the inertial frame of reference. One accomplishes this by using a rotation matrix described below (Vallado, 1997: 54).

$$R = \begin{bmatrix} \cos \Omega \cos \omega - \sin \Omega \sin \omega \cos i & -\cos \Omega \sin \omega - \sin \Omega \cos \omega \cos i & \sin \Omega \sin i \\ \sin \Omega \cos \omega + \cos \Omega \sin \omega \cos i & -\sin \Omega \sin \omega + \cos \Omega \cos \omega \cos i & -\cos \Omega \sin i \\ \sin \omega \sin i & \cos \omega \sin i & \cos i \end{bmatrix} \quad (17)$$

To find the inertial frame vector, one multiplies the perifocal frame vector by the rotation matrix (Vallado, 1997: 54).

$$\mathbf{R} = R\mathbf{r} \quad (18)$$

$$\mathbf{V} = R\mathbf{v} \quad (19)$$

Uppercase letters denote heliocentric reference frame vectors.

Utilizing these concepts, one is able to locate the planets and asteroids in the solar system at a given time. This research uses *ephemerides*, or tables that include classic orbital elements for the planets and asteroids, to locate the planets. Shown in Table 4 below is a sample of the ephemeris for the Earth (Yeomans, 2009).

Table 4: Sample Earth Ephemeris

JDCT	Julian Date	e	r_p	i	Ω	ω	T_p	n	M	θ	a	r_a	T
2010-Jan-01	2455197.5	0.0158	0.9833	0.0030	125.5417	337.5839	2.7618	0.9871	357.2739	357.1863	0.9990	1.0148	364.7220
2010-Jan-02	2455198.5	0.0158	0.9833	0.0030	125.5116	337.2153	1.3705	0.9870	358.6474	358.6038	0.9991	1.0148	364.7430
2010-Jan-03	2455199.5	0.0159	0.9833	0.0029	126.6811	335.6781	0.0096	0.9869	359.9905	359.9902	0.9992	1.0150	364.7925

JDCT, Epoch Julian Date, Coordinate Time
e, Eccentricity
 r_p , Periapsis distance (AU)
i, Inclination w.r.t XY-plane (degrees)
 Ω , Longitude of Ascending Node, (degrees)

ω , Argument of Perifocus (degrees)
 T_p , Time of periapsis relative to epoch (P-E) (day)
n, Mean motion (degrees/day)
M, Mean anomaly (degrees)

θ , True anomaly (degrees)
a, Semi-major axis (AU)
 r_a , Apoapsis distance (AU)
T, Orbital period (day)

The ephemerides used include data for each planet for each day from January 1 2010 until December 31 2025. Finding each planet is not necessary for the problem when the two-body equations of motion are used, but are important when one numerically integrates the N-body problem to find transfer trajectories. Because it is recommended as follow-on work to look at the N-body problem, locating the planets in the solar system at a given moment in time is included in the code to make it easier for such follow-on work. This makes it easy to locate the planet of interest, because it only requires a table lookup for the key classic orbital elements. Using the equations above, once can find the position and velocity vectors in the inertial frame. One needs to know this information in order to do the calculations for leaving Earth and to know where the Earth is on the return trip from an asteroid.

True anomaly is not given for the asteroids because their orbital elements are just a snapshot in time, which means one has to do a few more calculations to find the position and velocity vectors. All the other classic orbital elements given for the planets are also given for the asteroids, but the asteroid ephemerides do not include these elements for each day like for the planets, so one has to propagate these quantities in time. The asteroid ephemerides include one snapshot of the orbit for each of the 6509 asteroids examined for this research. Table 5 shows an example of some asteroid ephemerides (Yeomans, 2009).

Table 5: Sample Asteroid Ephemeris

Object #	Object	Class	Epoch	a	e	i	ω	Ω	M	r_p	r_a	T
1	433 Eros	AMO	55200	1.458105	0.222789	10.82932	178.7591	304.3716	303.6777988	1.1333	1.78	1.76
2	719 Albert	AMO	55200	2.627522	0.552836	11.56081	155.8166	184.0614	344.0968609	1.1749	4.08	4.26
3	887 Alinda	AMO	55200	2.479046	0.56688	9.352891	350.3277	110.5632	54.5322917	1.0737	3.88	3.9

Epoch	Osculating epoch of the elements given as the modified Julian date (Julian date - 2400000.5) TDB	Ω (deg)	Longitude of the ascending node in degrees
a (AU)	Semi-major axis of the orbit in AU	M (deg)	Mean anomaly at epoch in degrees
e	Eccentricity of the orbit	r_p (AU)	Perihelion distance of the orbit in AU
i (deg)	Inclination of the orbit with respect to the ecliptic plane and the equinox of J2000 in degrees	r_a (AU)	Aphelion distance of the orbit in AU
ω (deg)	Argument of perihelion in degrees	T (yr)	Orbital period in Julian years
Class	Object classification: NEA="Near-Earth Asteroid", AMO="Amor", APO="Apollo", ATE="Aten", or IEO="Interior Earth Object". A trailing "*" indicates the object is also a potentially hazardous asteroid.		

Appendix A shows a complete list of the asteroid ephemerides used in this research.

This research also looks at the possibility of flying by a comet. Table 6 below is a sample of the comet ephemerides (Yeomans, 2009).

Table 6: Sample Comet Ephemeris

Object #	Object	Epoch	e	i	ω	Ω	r_p	r_a	T
1	1P/Halley	49400	0.967143	162.2627	111.3325	58.42008	0.585978	35.08	75.32
2	2P/Encke	55044	0.847946	11.78285	186.4988	334.5696	0.336976	4.1	3.3
3	3D/Biela	-9480	0.751299	13.2164	221.6588	250.669	0.879073	6.19	6.65

Epoch	Osculating epoch of the elements given as the modified Julian date (Julian date - 2400000.5) TDB	Ω (deg)	Longitude of the ascending node in degrees
e	Eccentricity of the orbit	r_p (AU)	Perihelion distance of the orbit in AU
i (deg)	Inclination of the orbit with respect to the ecliptic plane and the equinox of J2000 in degrees	r_a (AU)	Aphelion distance of the orbit in AU
ω (deg)	Argument of perihelion in degrees	T (yr)	Orbital period in Julian years

Appendix B shows a complete list of the comet ephemerides used in this research.

To find these objects, one starts with the *mean anomaly*, M , to locate the *eccentric anomaly*, E . One can think of these as merely angles that will be helpful in determining the true anomaly, which is useful in obtaining positions and velocities. M is handy because it increments linearly via n . E is a means of connecting M to the true anomaly. This research uses mean anomaly to find the time since periapsis passage for the asteroid via the equation below (Wiesel, 1997: 59).

$$M = \sqrt{\frac{\mu}{a^3}}(t - T_0) \quad (20)$$

One sees that the first term is simply the mean motion, n ; the t in this equation is the *epoch time*, since M is given for the epoch time. The unknown, T_0 , is the *time of periapsis passage*. Shown below is the relation between M and E (Wiesel, 1997: 58).

$$M = E - e \sin E \quad (21)$$

Since one typically knows M and e , the unknown here is E . However, since this is a transcendental equation (the unknown variable cannot be algebraically separated and isolated), the solution requires an iterative approach. This research uses the Newton-

Raphson method to solve this equation. Shown below is this approach (Turns, 2006: 659).

$$x_{k+1} = x_k - \frac{f(x_k)}{f'(x_k)} \quad (22)$$

In words, this means that one guesses at the solution, x_k , to the transcendental equation, $f(x_k)$, and subtracts the ratio of $f(x_k)$ to its derivative with respect to the independent variable. The new estimated solution is x_{k+1} . One then runs this new solution into the Newton-Raphson equation until the solution converges to a value that solves the transcendental equation to the desired degree of accuracy.

With E known, one can solve for the true anomaly via the following (Wiesel, 1997: 59).

$$\theta = 2 \tan^{-1} \left(\sqrt{\frac{1+e}{1-e}} \tan \left(\frac{1}{2} E \right) \right) \quad (23)$$

Now, one is able to use the equations outlined thus far to locate the asteroids and comets of interest with respect to time. For more information and derivations of the equations shown above, see *Spaceflight Dynamics* by Wiesel.

Solving the Gauss Problem

Carl Fredrich Gauss (1777-1855) later worked on predicting the future location of Ceres, the first asteroid discovered that orbits between Mars and Jupiter, from three sets of angle observations between 1801 and 1802 (Bate, Mueller, and White, 1971). He was correct in calculating the propagated location of the asteroid. This may seem like a minor accomplishment today when compared to the hundreds of new asteroids discovered,

tracked, and orbits propagated every year, but this was a monumental display of Mathematical prowess on the part of Gauss. Using two position vectors and time-of-flight between them is another way to solve this problem and is what Bate, Mueller, and White call the “Gauss problem” (1971: 228). Johann Heinrich Lambert (1728-1777) worked on the problem of solving the differential equation relating two position vectors and two times between them before Gauss, so this problem is sometimes referred to as *Lambert’s problem*. Because Gauss’s approach lends itself more readily to this problem, this research will refer to this as the Gauss problem.

Solution of the Gauss problem is pivotal in searching for solutions for orbit rendezvous of asteroids and comets and is used extensively in this research to search the enormous $6509!$ (factorial) solution space for feasible target objects. The code uses two approaches to solve this problem; one is the universal variable method, and the other is the p-iteration method. Outlined below is the universal variable method, since it is the preferred method for this research. For information regarding the p-iteration technique, see *Fundamentals of Astrodynamics* by Bate, Mueller, and White.

The problem starts with the position of the spacecraft orbiting the Earth, \mathbf{R}_1 . The spacecraft occupies this position at the moment right before it maneuvers into the trajectory to get to a chosen asteroid or comet. The next decision is the desired *time-of-flight*, Δt . This research includes a parametric study on the time-of-flight to find values that correspond to the most solutions possible. A section below outlines this study. \mathbf{R}_2 is the position of the NEO at $t+\Delta t$, where \mathbf{R}_1 is its position at the time, t . The Gauss

problem requires these two position vectors and their magnitudes. Shown below are the magnitude calculations.

$$R_1 = \sqrt{R_{1x}^2 + R_{1y}^2 + R_{1z}^2} \quad (24)$$

$$R_2 = \sqrt{R_{2x}^2 + R_{2y}^2 + R_{2z}^2} \quad (25)$$

Also required in the Gauss calculations is the angle between these two vectors, v . Shown below is the calculation to find this quantity.

$$v = \cos^{-1} \left(\frac{\mathbf{R}_1 \cdot \mathbf{R}_2}{R_1 R_2} \right) \quad (26)$$

The universal variables method uses many dummy variables to connect the positions to the end-result, which are two velocity vectors. Shown below is the first of these variables, A (Bate, Mueller, and White, 1971: 237):

$$A = DM \sqrt{R_1 R_2 (1 + \cos v)} \quad (27)$$

The only unknown in this equation is the *direction of motion* (DM) of the spacecraft. The geometry allows two solutions to this problem, one being a “short” way and the other a “long” way. Shown below is a depiction of this geometry option, which has been adapted from Bate, Mueller, and White by Captain Barry Witt.

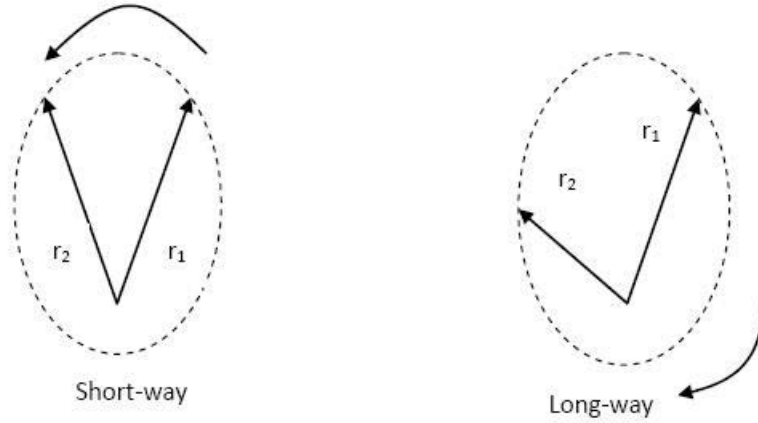


Figure 6: Gauss Problem Geometry

If one chooses the short way, DM takes the value of +1; it is equal to -1 if one chooses the long way.

The tricky part to this method is that it requires iterating on time-of-flight in equation 28 to find $F(z)$ equal to zero. This requires finding the dummy variable, z , to find Δt and then z is iterated until the solution Δt is equal to the desired value.

$$F(z) = (x^3)S(z) + A\sqrt{y} - \sqrt{\mu}\Delta t \quad (28)$$

So, one picks a starting value of z and then evaluates the following. Equations 29 and 30 show the Stumpff functions, which begin the process (Bate, Mueller, and White, 1971: 196):

$$C(z) = \frac{1}{2!} - \frac{z}{4!} + \frac{z^2}{6!} - \frac{z^3}{8!} + \frac{z^4}{10!} - \dots \quad (29)$$

$$S(z) = \frac{1}{3!} - \frac{z}{5!} + \frac{z^2}{7!} - \frac{z^3}{9!} + \frac{z^4}{11!} - \dots \quad (30)$$

These feed into the next set of dummy variables, y , and x . Equations 31 and 32 relate these variables and are the next step in the process (Bate, Mueller, and White, 1971: 232-233):

$$y = R_1 + R_2 - A \frac{(1 - zS(z))}{\sqrt{C(z)}} \quad (31)$$

$$x = \sqrt{\frac{y}{C(z)}} \quad (32)$$

At this point, the goal is to get $F(z)$ equal to zero, which would indicate that the chosen value of z is the correct value to produce the desired Δt . It is unlikely that the initial chosen value of z will be correct and one will have to perform iterations to get this equation to converge on a solution. Once again, this research uses the Newton-Raphson method. To do this, one needs the derivative of $F(z)$ with respect to z . This equation is different depending on if z is equal to zero or not. Equations 33 and 34 show the different cases and come from *Orbital Mechanics for Engineering Students* by Curtis (2005: 187):

$$F'(z) = \frac{\sqrt{2}}{40} y(0)^{\frac{3}{2}} + \frac{A}{8} \left[\sqrt{y(0)} + A \sqrt{\frac{1}{2y(0)}} \right] \quad \text{for } z = 0 \quad (33)$$

$$F'(z) = \left[\frac{y(z)}{C(z)} \right]^{\frac{3}{2}} \left\{ \frac{1}{2z} \left[C(z) - \frac{3}{2} \frac{S(z)}{C(z)} \right] + \frac{3}{4} \frac{S(z)^2}{C(z)} \right\} + \frac{A}{8} \left[3 \frac{S(z)}{C(z)} \sqrt{y(z)} + A \sqrt{\frac{C(z)}{S(z)}} \right] \quad \text{for } z \neq 0 \quad (34)$$

Equation 35 outlines how to find the next value of z to try:

$$z_{i+1} = z_i - \frac{F(z_i)}{F'(z_i)} \quad (35)$$

Once the z value above produces a desired tolerance, or difference in the chosen value and calculated value (10^{-14} is used in this research), in the Δt the z is considered to be

the solution required. One uses this z value to calculate the Lagrange coefficients as shown in equations 36-39 (Bate, Mueller, and White, 1971: 233):

$$f = 1 - \frac{y(z)}{R_1} \quad (36)$$

$$g = A \sqrt{\frac{y(z)}{\mu}} \quad (37)$$

$$\dot{g} = 1 - \frac{y(z)}{R_2} \quad (38)$$

$$\dot{f} = \frac{\sqrt{\mu}}{R_1 R_2} \sqrt{\frac{y(z)}{C(z)}} [zS(z) - 1] \quad (39)$$

Equations 40 and 41 produce the desired velocity vectors (Bate, Mueller, and White, 1971: 233):

$$\mathbf{V}_1 = \frac{\mathbf{R}_2 - f\mathbf{R}_1}{g} \quad (40)$$

$$\mathbf{V}_2 = \frac{\dot{g}\mathbf{R}_2 - \mathbf{R}_1}{g} \quad (41)$$

The \mathbf{V}_1 vector is what is needed to be on the transfer trajectory to visit the desired object that will be at \mathbf{R}_2 after Δt passes. Since the spacecraft will have a velocity associated with its parking orbit around the Earth that will differ from \mathbf{V}_1 , the characteristic velocity required to get the spacecraft onto the transfer orbit from the parking orbit is found via equation 42:

$$\Delta V_1 = \sqrt{V_{1x}^2 + V_{1y}^2 + V_{1z}^2} - \sqrt{V_{sx}^2 + V_{sy}^2 + V_{sz}^2} \quad (42)$$

Where $V_{sx,y,z}$ are the components of the velocity vector of the spacecraft in its parking orbit after it has been rotated into the heliocentric reference frame. Characteristic velocities, more often called *delta-V's* are important quantities in orbital mechanics because they represent the amount of energy or fuel required to maneuver through space. *Fundamentals of Electric Propulsion: Ion and Hall Thrusters* by Goebel, and Katz outlines the approximate amount of fuel, m_p , required for a given ΔV (2008: 17):

$$m_p = m_d \left[e^{\frac{\Delta V}{I_{sp} * g_0}} - 1 \right] \quad (43)$$

Where m_d is the *dry mass of the spacecraft* (without fuel); I_{sp} is the *specific impulse* of the engines and ranges between approximately 250-400 seconds for conventional impulsive thrust devices; and g_0 is the *acceleration due to gravity* at sea-level for Earth. In most spacecraft applications, the amount of propellant available is a known value, so this constrains the amount of ΔV that a spacecraft can produce in its lifetime. Equation 44 shows the amount of ΔV possible for an amount of fuel (Goebel and Katz, 2008: 17):

$$\Delta V = (I_{sp} * g_0) \ln \left(\frac{m_d + m_p}{m_d} \right) \quad (44)$$

Equations 43 and 44 will be used later to compare Table 2 to the results of this research.

This will put the spacecraft on a transfer trajectory to visit an NEO, but one still needs to do some work to learn more about this transfer trajectory. Knowing \mathbf{R}_1 and \mathbf{V}_1 allows one to use the methods outlined in *Spaceflight Dynamics* by Wiesel to find the classic orbital elements pertaining to this transfer orbit. Start with the angular momentum equation as shown before, but modified to show the variables of interest (Wiesel, 1997: 62):

$$\mathbf{H} = \mathbf{R}_1 \times \mathbf{V}_1 \quad (45)$$

One can then find the energy of the orbit, its eccentricity vector, and \mathbf{n} (Wiesel, 1997: 62):

$$\varepsilon = \frac{1}{2} V_1^2 - \frac{\mu}{R_1} \quad (46)$$

With the energy, one can now find the semimajor axis (Wiesel, 1997: 62):

$$a = -\frac{\mu}{2\varepsilon} \quad (47)$$

$$\mathbf{e} = \frac{1}{\mu} \left(\mathbf{V}_1 \times \mathbf{H} - \frac{\mu \mathbf{R}_1}{R_1} \right) \quad (48)$$

$$\mathbf{n} = \frac{\mathbf{k} \times \mathbf{H}}{|\mathbf{k} \times \mathbf{H}|} \quad (49)$$

where $\mathbf{k} = [0,0,1]$. This leads to Ω (Wiesel, 1997: 62):

$$\mathbf{n} = \cos \Omega \mathbf{i} + \sin \Omega \mathbf{j} \quad (50)$$

Utilizing the cosine and sine of Ω from the equation above and equating the values to the coefficients for the \mathbf{i} and \mathbf{j} components of equation 48 allows one to find Ω in its proper quadrant. Next, find the inclination via the following equation (Wiesel, 1997: 62):

$$i = \cos^{-1} \left(\frac{\mathbf{k} \cdot \mathbf{H}}{|\mathbf{H}|} \right) \quad (51)$$

The argument of periapsis for the orbit is determined next (Wiesel, 1997: 63):

$$\omega = \cos^{-1} \left(\frac{\mathbf{n} \cdot \mathbf{e}}{|\mathbf{e}|} \right) \quad (52)$$

This equation is correct if $\mathbf{e} \cdot \mathbf{k} > 0$. If this is not true, then ω requires a quadrant adjustment. Next, find true anomaly (Wiesel, 1997: 63):

$$\theta = \cos^{-1} \left(\frac{\mathbf{e} \cdot \mathbf{R}_1}{eR_1} \right) \quad (53)$$

If $\mathbf{R}_1 \cdot \mathbf{V}_1 > 0$, then $\theta < 180$ degrees. With true anomaly, one can get eccentric anomaly using the following equation (Wiesel, 1997: 63):

$$E = 2 \tan^{-1} \left(\sqrt{\frac{1-e}{1+e}} \tan \frac{\theta}{2} \right) \quad (54)$$

Using this, one can find the mean anomaly (Wiesel, 1997: 63):

$$M = \sqrt{\frac{\mu}{a^3}} (t_0 - T_0) = E - e \sin E \quad (55)$$

This equation provides the solution for finding the time since periapsis passage. These equations allow one to find the spacecraft in the perifocal frame of the transfer orbit for any given time after the initial maneuver.

The spacecraft will travel along this orbit henceforth unless one performs another maneuver. After Δt has passed, the spacecraft will encounter the chosen NEO. At this point, the spacecraft can either continue on the transfer orbit trajectory and flyby the object, or perform another delta-V to put the spacecraft into the same orbit as the object. The solution to the Gauss problem provides the velocity vector along the transfer orbit at the point of potential rendezvous. The following equation provides the delta-V required for a rendezvous:

$$\Delta V_2 = \sqrt{(V_{Ox} - V_{2x})^2 + (V_{Oy} - V_{2y})^2 + (V_{Oz} - V_{2z})^2} \quad (56)$$

\mathbf{V}_O is the velocity of the NEO at time Δt . If one does not wish to rendezvous, but merely flyby the object, this delta-V then represents the relative flyby speed.

One utilizes a rotation matrix once again to find the position and velocity vectors of the transfer orbit in the heliocentric frame. Wiesel outlines how to use the following vectors to define a rotation matrix to transform perifocal vectors into the inertial frame (1997: 67):

$$\mathbf{p} = \frac{\mathbf{e}}{e} \quad (57)$$

$$\mathbf{w} = \frac{\mathbf{h}}{h} \quad (58)$$

$$\mathbf{q} = \mathbf{w} \times \mathbf{p} \quad (59)$$

$$R = [\mathbf{p} \quad \mathbf{q} \quad \mathbf{w}] \quad (60)$$

One uses the *rotation matrix*, R , the same way as shown before to transform a vector from the perifocal frame to the inertial frame.

This completes the information required to find the NEOs, flyby/rendezvous with one, and represent vectors of interest in the inertial frame. The following sections outline how to pick an appropriate object to visit and how to approach the return trajectory in order to visit another NEO at virtually no delta-V expenditure.

Picking the First Object to Visit

The first thing to decide is a desired time-of-flight to use when solving the Gauss problem for each asteroid. This is useful to see which number of days for the transfer trajectory yields the maximum possible solutions to the Gauss problem. This was completed from Earth's sphere of influence (SOI) to the asteroid population. Shown below in Figure 7 are the results of this study.

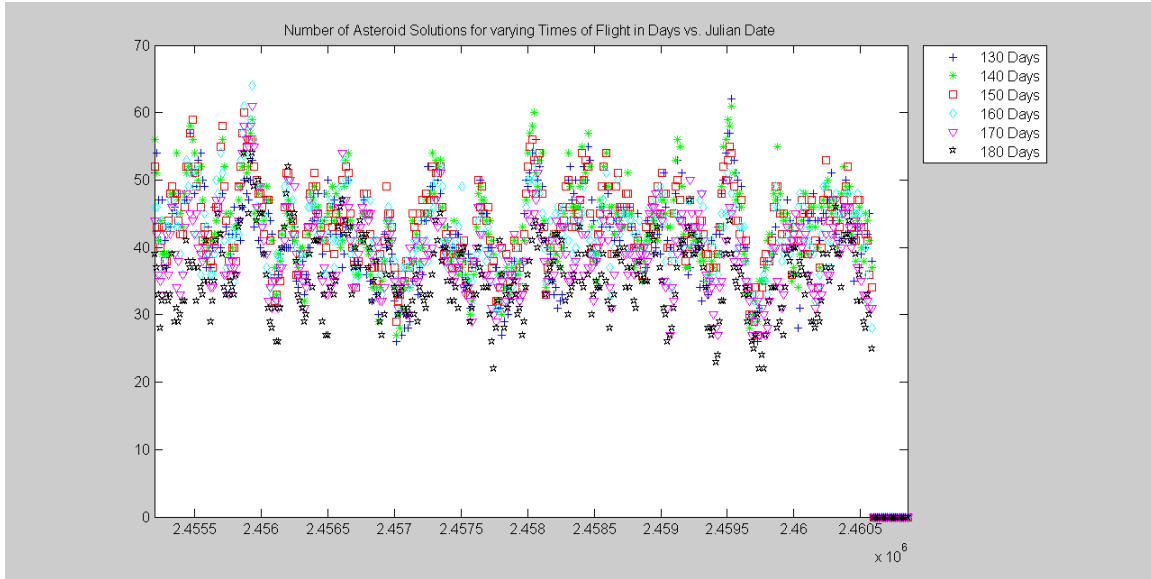


Figure 7: Gauss Solutions vs. Time-of-Flight

This study started the spacecraft at the Earth's SOI to avoid issues with the dynamics of the orbit around the Earth. Appendix H has the full results of this study.

The next thing the user needs to decide when running the code for this research is the desired launch date. To aid the user, a parametric study was done to see how varied launch dates affected the possible solutions for less than 10 km/s initial delta-V maneuvers from Earth's SOI to the transfer trajectory. The time-of-flight parametric study provided the Δt to use for the launch date study. Figures 8 and 9 show the results of this study.

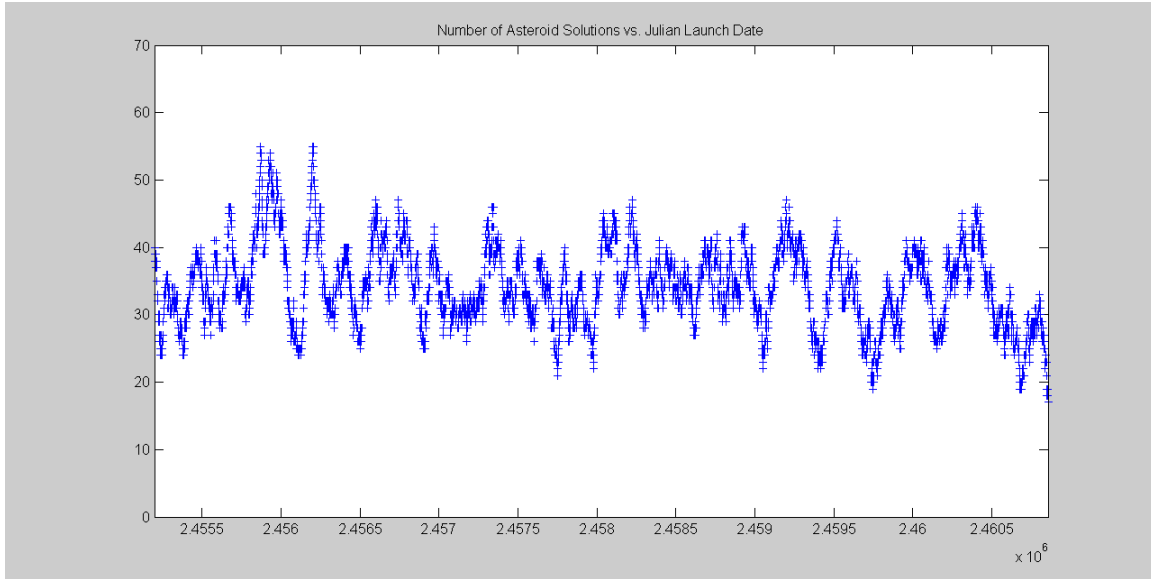


Figure 8: Asteroid Solutions vs. Launch Date

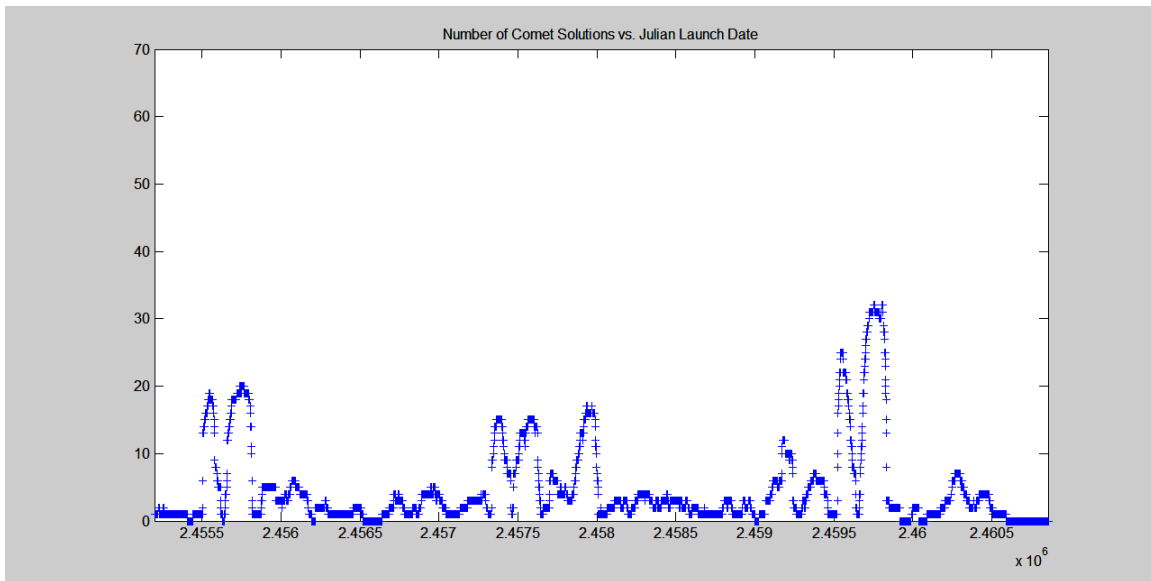


Figure 9: Comet Solutions vs. Launch Date

When one utilizes these results to get from the Earth to the SOI, additional days are required to account for getting from a parking orbit around Earth to the edge of the SOI. The Δt used for the research is set at around half of a year to maximize the possible

solutions to go from Earth orbit to the distances required for the bulk of the asteroids.

Shown below is the calculation to find Earth's SOI (Curtis, 2005: 440):

$$\frac{r_{SOI}}{R} = \left(\frac{m_p}{m_s} \right)^{\frac{2}{5}} \quad (61)$$

where r_{SOI} is the *radius of the SOI*, R is the *planet's radius*, m_p is the *planet's mass*, and m_s is the *Sun's mass*. The result of this is that the radius of Earth's SOI is approximately 145 Earth radii. This distance is very small when compared to an *astronomical unit* (AU), which is the average distance from the Sun to the Earth. One AU is approximately 23,455 Earth radii. The Earth's SOI is only 0.6% of this value, which means that it is a tiny speck when compared to the distances involved in this problem.

One of the desired constraints for this problem is that the transfer orbit period be approximately equal to the period of the Earth around the Sun. This allows the spacecraft to return when the Earth is at approximately the same location as it was when the spacecraft left. The code utilizes a user-defined period tolerance (difference between the transfer orbit period and Earth's period) of between three and five days to sift through the number of total solutions found via the universal variables Gauss problem solver. The chosen Δt typically results in around three to five thousand solutions available out of the 6509 asteroids and 157 comets used for the research. With the period tolerance, delta-V limit (set at lower than 10 km/s), and constraint that the magnitude of the departure orbit be approximately equal to the magnitude of the velocity of the Earth around the sun, this solution space decreases to around 20-40 possible objects to visit. Another parameter to consider is the *hyperbolic excess speed*, v_∞ (Wiesel, 1997: 308):

$$v_{\infty} = V_1 - V_E \quad (62)$$

The magnitude of v_{∞} can be high if the spacecraft takes on a trajectory that is opposite in direction to that of the Earth's trajectory even if their magnitudes are equal. This and the relative flyby speed mentioned above are the final things to minimize when choosing from the approximate 20-40 solutions available for the first object to visit. One would like a small relative flyby speed because if the object and the spacecraft are traveling in opposite directions when they pass, it will be harder to take measurements/pictures of the object due to the relative speeds involved.

With the method in place to select the launch date, time-of-flight, and first object to visit, the next step is deciding how to pick the next object to visit while minimizing the delta-V required. One accomplishes this by utilizing a deep space maneuver (DSM) to return to Earth in such a way to use the Earth's gravity to rotate the velocity of the spacecraft into that required for a transfer trajectory to rendezvous with another NEO.

The Return Trajectory to Earth and Picking Subsequent Objects to Visit

After visiting the first NEO, if the spacecraft does a flyby, it will remain on the same transfer trajectory orbit and will begin the return leg of the transfer trajectory to Earth. The case where the spacecraft rendezvous with the NEO requires another solution of the Gauss problem to put the spacecraft back on a return trajectory to Earth. Since the spacecraft dwells around the NEO, it will be on the NEO's orbit, which will not return it to Earth. If the Gauss-solver parameters are setup correctly, the spacecraft can still impact the Earth's SOI in such a way to allow a visit to another object using the same methods outlined below.

The advantage of utilizing a DSM before the spacecraft impacts the Earth's SOI is that maneuvers done far from gravity wells require very little energy to affect potentially large changes in the position and velocity vectors downstream from the maneuver. Figure 10 below shows the geometry involved when the spacecraft is seeing the Earth from deep space.

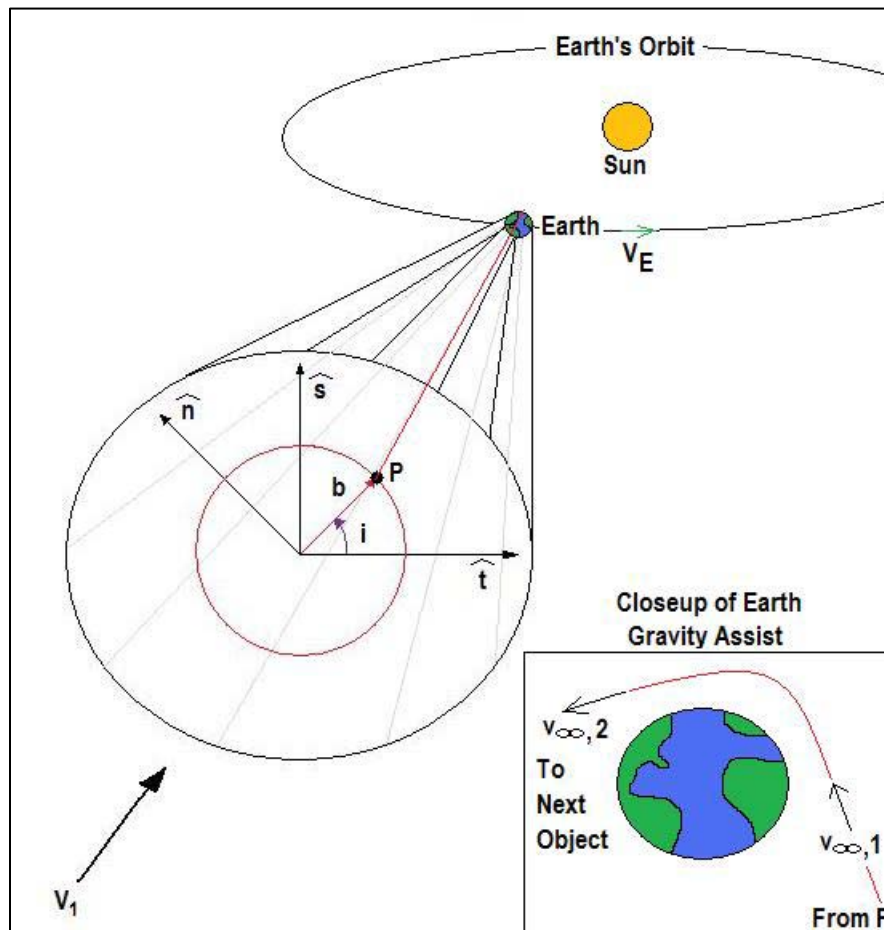


Figure 10: Spacecraft View of Earth from Deep Space

This figure is from the perspective of looking down V_1 , which is the asteroid's velocity vector when it is outside Earth's SOI. Before one can choose how to approach the Earth, some unit vectors are helpful in identifying the approach vectors. One will

know the position of the spacecraft for each day along its transfer trajectory, so starting from a position just outside Earth's SOI, one can attach a coordinate frame to the spacecraft. First, identify a vector perpendicular to \mathbf{V}_1 and \mathbf{k} , which will be called \mathbf{t} . The next vector can be found by crossing \mathbf{V}_1 and the newly found t-vector. Finally, the last vector of the frame is found by combining components of the other frame vectors according to the angle, i , which is a free variable called *inclination*. This inclination is measured from \mathbf{t} and is different from the inclination of orbits talked about previously. These become unit vectors when one divides each by its magnitude.

The *impact parameter*, b , describes the perpendicular distance from \mathbf{V}_1 , to the incoming leg of the gravity assist hyperbola on which $\mathbf{v}_{\infty,1}$ points. One can think of this scenario as being similar to a three-dimensional funnel in space connecting the spacecraft to the Earth. The free variable, b , identifies the funnel's opening radius and i identifies where along the funnel's circumference the spacecraft will enter. We will call this entry point, P . Once these variables are chosen, the spacecraft will travel from P to the Earth along the transfer trajectory and then turn around the Earth along a hyperbola during the gravity assist. Mathematical expressions for these concepts are shown below.

Equation 63 shows \mathbf{t} (Wiesel, 2010):

$$\hat{\mathbf{t}} = \frac{\mathbf{V}_1 \times \mathbf{k}}{|\mathbf{V}_1 \times \mathbf{k}|} \quad (63)$$

Equation 64 describes the s unit vector (Wiesel, 2010):

$$\hat{\mathbf{s}} = \frac{\hat{\mathbf{t}} \times \mathbf{V}_1}{|\hat{\mathbf{t}} \times \mathbf{V}_1|} \quad (64)$$

The following equation shows the orbit normal for the hyperbola orbit about the Earth (Wiesel, 2010):

$$\hat{\mathbf{n}} = -\sin i \hat{\mathbf{t}} + \cos i \hat{\mathbf{s}} \quad (65)$$

As the spacecraft approaches Earth, it will have an excess velocity vector with respect to the Earth given by the following (Wiesel, 2010):

$$\mathbf{v}_{\infty,1} = \mathbf{V}_1 - \mathbf{V}_{E,1} \quad (66)$$

The goal is to try to find the right combination of b and i to turn this vector in such a way as to produce the right velocity for a transfer trajectory to another object. The equation below expresses this goal (Wiesel, 2010):

$$\mathbf{V}_2 = \mathbf{v}_{\infty,2} + \mathbf{V}_{E,1} \quad (67)$$

$\mathbf{V}_{E,1}$ in equation 67 is the heliocentric velocity vector of Earth when the spacecraft is approaching.

The problem then becomes one of running the NEOs through the Gauss solver and comparing the velocity vector required against \mathbf{V}_2 . If the two are equivalent, then the goal of finding a low delta-V solution is complete. The first step in turning $\mathbf{v}_{\infty,1}$ into $\mathbf{v}_{\infty,2}$ is to find the turning angle required. The following conclusions are the result of derivations for this problem done by Dr. William Wiesel. Once inside the Earth's SOI, one can put a unit vector along the incoming $\mathbf{v}_{\infty,1}$ vector and call it \mathbf{e}_v and a unit vector tangential to this, \mathbf{e}_t . The orbit normal unit vector is then \mathbf{e}_N . The following gives the orbit's angular momentum vector (Wiesel, 2010):

$$\mathbf{H} = \mathbf{r} \times \mathbf{v} = b v_{\infty} \mathbf{e}_N \quad (68)$$

The following gives the orbit's eccentricity vector (Wiesel, 2010):

$$\mathbf{e} = \frac{1}{\mu} \left(\mathbf{v} \times \mathbf{H} - \mu \frac{\mathbf{r}}{r} \right) \quad (69)$$

Since \mathbf{v}_∞ is perpendicular to \mathbf{H} , the cross product shown here is equal to $v_\infty \mathbf{H} \mathbf{e}_t$. At essentially “infinity,” the unit vector \mathbf{r}/r is equivalent to $-\mathbf{e}_v$. Substituting these into the equation above yields the following for the magnitude of the eccentricity vector (Wiesel, 2009):

$$e = \sqrt{1 + \frac{b^4 v_\infty^4}{\mu^2}} \quad (70)$$

The following equation gives the true anomaly for the hyperbola by utilizing the eccentricity (Wiesel, 2009):

$$\theta_\infty = \cos^{-1} \left(-\frac{1}{e} \right) \quad (71)$$

The next equation gives the *turning angle* through which the hyperbolic excess velocity vector rotates (Wiesel, 2009):

$$\delta = 2\theta_\infty - \pi \quad (72)$$

One notices that δ is dependent on b , so the research code iterates on b until it finds the right turning angle to patch the two transfer trajectories. The last aspect will be actually turning the incoming vector into the outgoing vector, which requires an application of Euler’s Formula. According to Shuster, transforming a physical vector, \mathbf{a} , into another physical vector, \mathbf{b} , with equal magnitude by a counterclockwise rotation about an axis vector, \mathbf{n} through an angle, v is given by (2006: 364):

$$\mathbf{b} = (\cos v)\mathbf{a} + (1 - \cos v)(\mathbf{n} \cdot \mathbf{a})\mathbf{n} + (\sin v)\mathbf{n} \times \mathbf{a} \quad (73)$$

The following equation substitutes the vectors and angles for this problem into equation 73 above:

$$\mathbf{v}_{\infty,2} = (\cos \delta) \mathbf{v}_{\infty,1} + (1 - \cos \delta)(\hat{\mathbf{n}} \cdot \mathbf{v}_{\infty,1})\hat{\mathbf{n}} + (\sin \delta)\hat{\mathbf{n}} \times \mathbf{v}_{\infty,1} \quad (74)$$

Since the \mathbf{n} unit vector is dependent on \mathbf{i} and δ is dependent on \mathbf{b} , the code iterates these quantities until it finds a $\mathbf{v}_{\infty,2}$ that works for sending the spacecraft into a follow-on transfer trajectory. Finally, ensuring the following constraint keeps the delta-V required minimized:

$$|\mathbf{V}_2| = |\mathbf{V}_{E,2}| \quad (75)$$

Substituting into this equation the \mathbf{V}_2 equation from above yields:

$$|\mathbf{V}_{E,2}| = |\mathbf{V}_{E,1} + \mathbf{v}_{\infty,2}| \quad (76)$$

$\mathbf{V}_{E,2}$ is the heliocentric velocity vector of the Earth when the spacecraft is leaving on a follow-on transfer trajectory. The equations above are what the research computer code balances to find acceptable follow-on targets to visit.

IV. Analysis and Results

MATLAB Code

The code developed for this research attempts to be robust enough to search for solutions within the enormous potential solution space by eliminating the unreasonable possibilities. For example, it includes constraints on characteristic velocity available, time-of-flight, and the period difference between the transfer trajectories and the Earth. The code design also tries to be user-friendly, so that anyone who has access to MATLAB can easily search for solutions using their desired launch date. The core of the code centers on solutions to the Gauss problem via either universal variables or p-iteration methods and extensive tables for the locations of the planets and the asteroids and comets. It utilizes the equations described above for this search.

Shown below are screen shots of the MATLAB program's graphical user interface to show the attempt to be user-friendly. The first figure shows a picture compiled using actual NASA photos to give the user an idea of what some of the objects involved in this research look like.

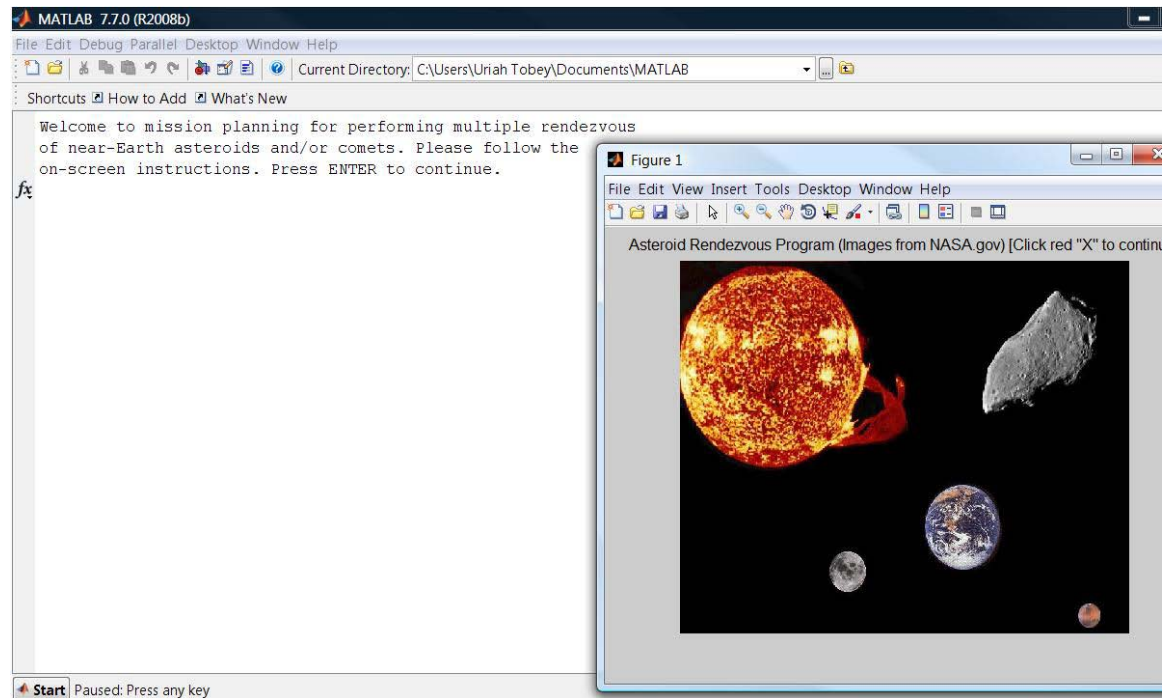


Figure 11: MATLAB Code Screen Shot 1

The next figure shows a shot of a figure that pops up to help the user understand how to manage the other figures that the program will present them throughout its operation.

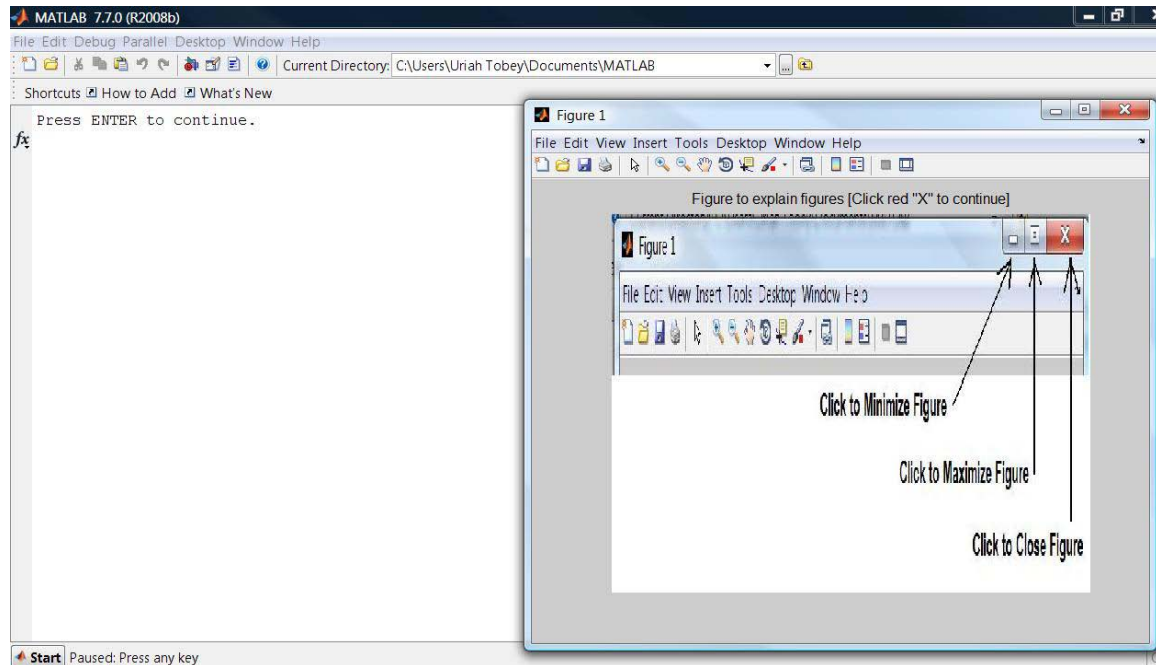


Figure 12: MATLAB Code Screen Shot 2

The next figure shows the section of the code that asks the user which geometry option they want to use for solving the Gauss problem.

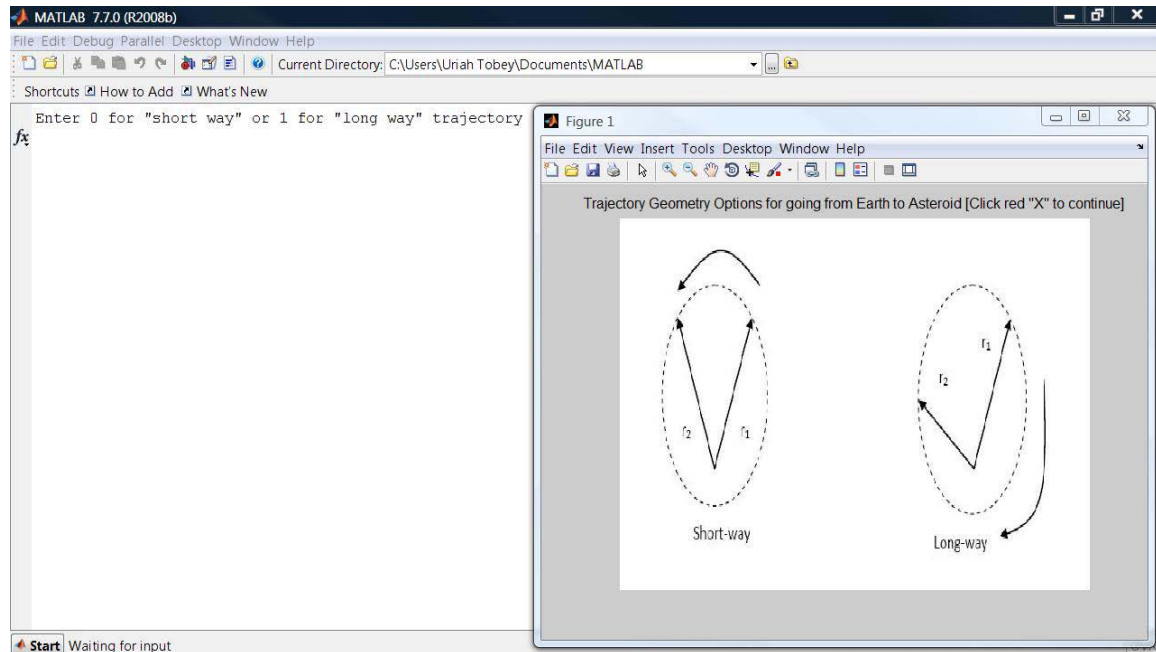


Figure 13: MATLAB Code Screen Shot 3

Figure 14 shows the section of the code that asks the user for their desired launch date and whether or not they want to use universal variables or p-iteration to solve the Gauss problem.

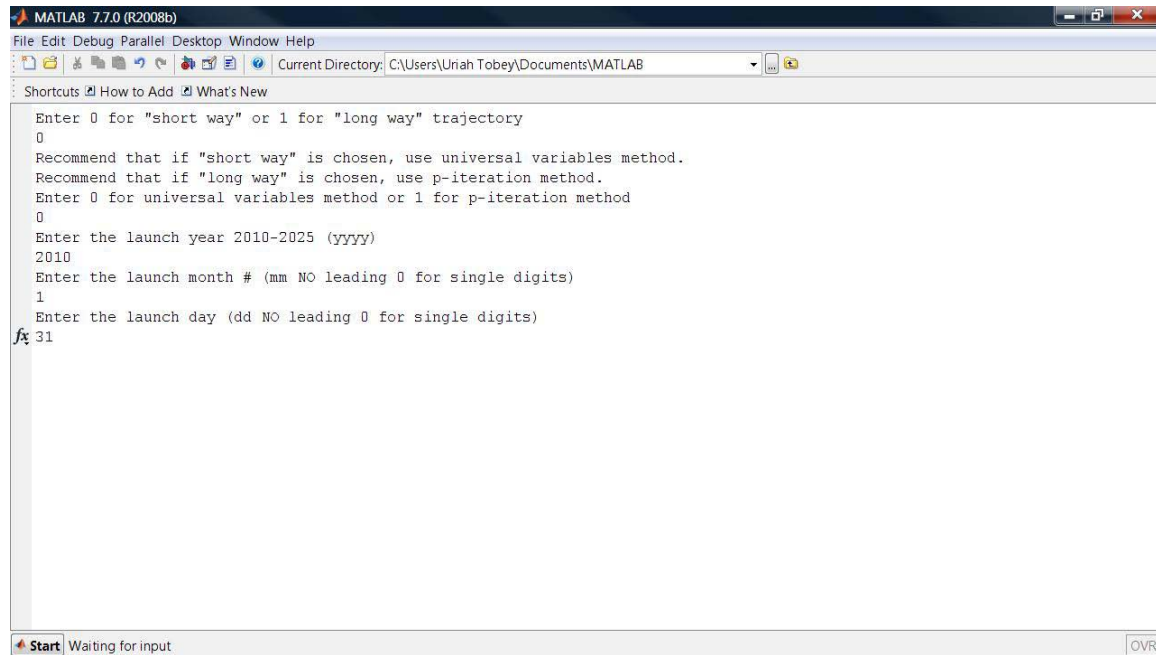
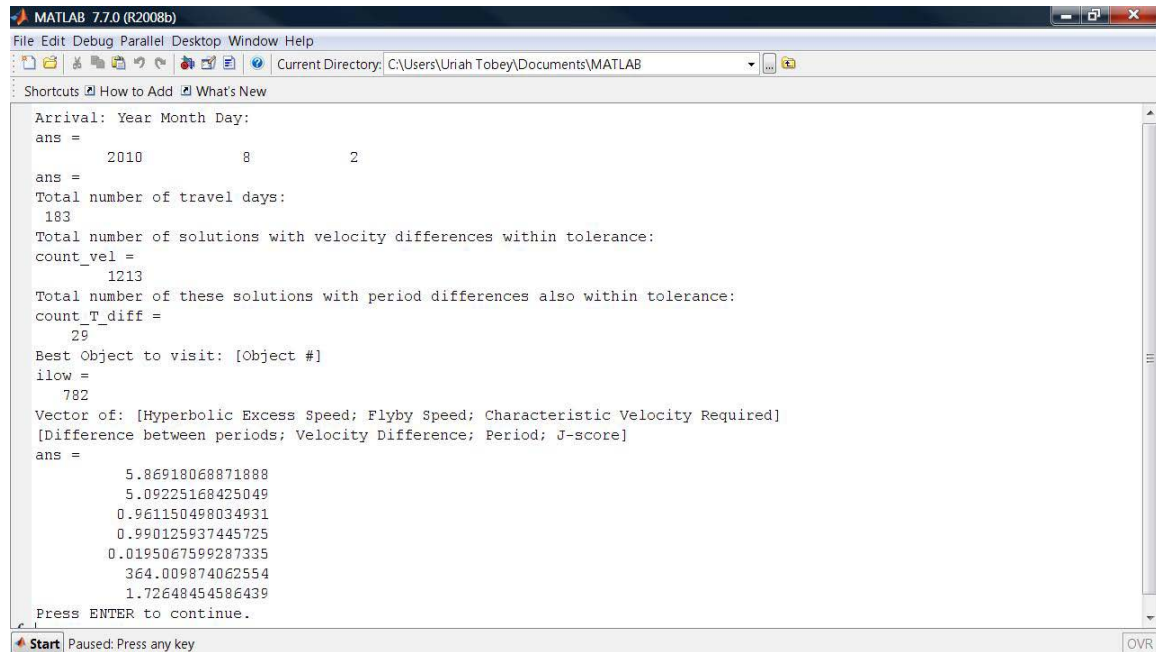


Figure 14: MATLAB Code Screen Shot 4

The following figure shows the section of the code that outputs the first object to visit, which it finds automatically by minimizing the constraints outlined above.



The image shows a MATLAB 7.7.0 (R2008b) window with the following code and output:

```
Arrival: Year Month Day:
ans =
    2010         8         2
ans =
    183
Total number of travel days:
    183
Total number of solutions with velocity differences within tolerance:
count_vel =
    1213
Total number of these solutions with period differences also within tolerance:
count_T_diff =
    29
Best Object to visit: [Object #]
ilow =
    782
Vector of: [Hyperbolic Excess Speed; Flyby Speed; Characteristic Velocity Required]
[Difference between periods; Velocity Difference; Period; J-score]
ans =
    5.86918068871888
    5.09225168425049
    0.961150498034931
    0.990125937445725
    0.0195067599287335
    364.009874062554
    1.72648454586439
Press ENTER to continue.
```

The status bar at the bottom indicates "Start" and "Paused: Press any key".

Figure 15: MATLAB Code Screen Shot 5

The next figure shows how the code outputs the object for the follow-on trajectory. This is after it has advanced the time and the spacecraft's position and velocity based on the trajectory established to visit the first object.

```

MATLAB 7.7.0 (R2008b)
File Edit Debug Parallel Desktop Window Help
Current Directory: C:\Users\Uriah Tobey\Documents\MATLAB
Shortcuts How to Add What's New

2011      1      30
Arrival: Year Month Day:
ans =
2011      8      1
ans =
Total number of travel days:
183
Total number of solutions with velocity differences within tolerance:
count_vel =
21
Total number of these solutions with period differences also within tolerance:
count_T_diff =
21
Best Object to visit: [Object #]
ilow =
4877
Vector of: [Hyperbolic Excess Speed; Flyby Speed; Characteristic Velocity Required]
[Difference between periods; Velocity Difference; Period; J-score]
ans =
7.54083914618019
3.26853501688929
0.0687142563540344
0.61549757940611
0.0359072955135323
364.384502420594
1.18586944515585
Start Paused: Press any key OVR

```

Figure 16: MATLAB Code Screen Shot 6

At this point, the code continues to advance the time, positions, and velocities of the spacecraft and searches for more follow-on objects that meet all of the constraints involved. If a follow-on object meets the constraints very closely, the code automatically chooses it and moves forward in time. It will continue until the date goes beyond 2025 as that is the last year of data used in the research for the locations of the planets.

Optimal Run

Having utilized the code to search two days of each month for 2010 as launch dates, January 31, 2010 was found to be the optimal launch date for visiting 16 objects in the 16-year period and has the minimum fuel expenditure. Based on the initial launch date of January 31, 2010, the code outputs the following locations of the asteroids and comets. Note that this figure is not drawn to scale and that if it was, one would not be

able to see any markers for the NEOs or planets. In fact, for the distances involved, a plot that is three AU by three AU would show the Sun to be so small that the naked eye would have difficulty recognizing it.

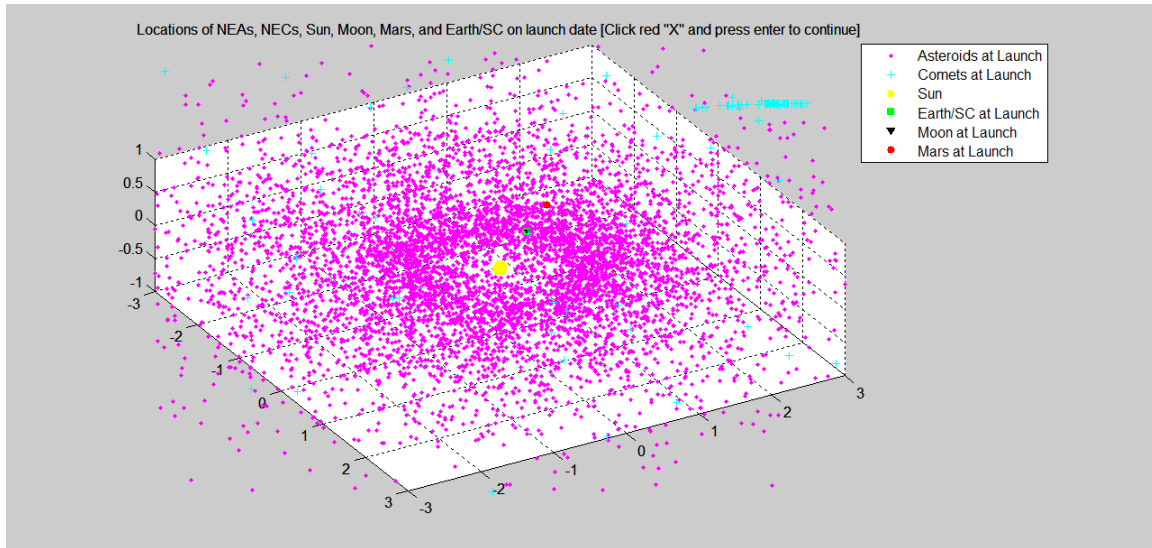


Figure 17: Sample Run Screen Shot – NEOs, Earth, Moon, Mars at Launch

Figure 18 below shows the first object chosen by the code to visit based on minimizing the constraints.

```

MATLAB 7.7.0 (R2008b)
File Edit Debug Parallel Desktop Window Help
Current Directory: C:\Users\Uriah Tobey\Documents\MATLAB
Shortcuts How to Add What's New

Arrival: Year Month Day:
ans =
    2010         8         2
ans =
    183
Total number of travel days:
    183
Total number of solutions with velocity differences within tolerance:
count_vel =
    1213
Total number of these solutions with period differences also within tolerance:
count_T_diff =
    29
Best Object to visit: [Object #]
ilow =
    782
Vector of: [Hyperbolic Excess Speed; Flyby Speed; Characteristic Velocity Required]
[Difference between periods; Velocity Difference; Period; J-score]
ans =
    5.86918068871888
    5.09225168425049
    0.961150498034931
    0.990125937445725
    0.0195067599287335
    364.009874062554
    1.72648454586439
Press ENTER to continue.
Start Paused: Press any key OVR

```

Figure 18: Sample Run Screen Shot – Selection of the First Object to Visit

The J-score is a value given to each object base on how well it meets the constraints. A perfect J-score would be zero, which would mean that it matches the constraints exactly. J-scores of approximately 1-5 are reasonable for this problem. Shown below is the equation for the J-score:

$$J_{score} = \frac{V_{\infty} + V_{flyby} + 5 * \Delta V + 5 * \Delta T}{12} \quad (76)$$

V_{∞} is the hyperbolic excess speed of the spacecraft found by taking the magnitude of the resulting vector from subtracting the Gauss solution \mathbf{V}_1 and the velocity vector of the Earth. V_{flyby} is the speed in which the spacecraft flies by the object. ΔV is the characteristic velocity required to visit the object. ΔT is the difference in orbital periods between the Earth and the transfer trajectory used to visit the object. The ideal case would be a zero J-score, which would mean that one would not have to impart any

velocity changes to the spacecraft to visit an asteroid. Unfortunately, this is the case of an NEO coming to visit the Earth-orbiting spacecraft and will likely have undesired results for some of Earth's inhabitants. Because the first two terms in the numerator are on the order of 10's and the last two terms are on the order of 1's, the 5's are added so that the last two terms make a difference in the calculation. The 12 in the denominator normalizes the result and accounts for the number of terms seen in the numerator.

Figures 19 and 20 show the plots of the planets at the given launch time.

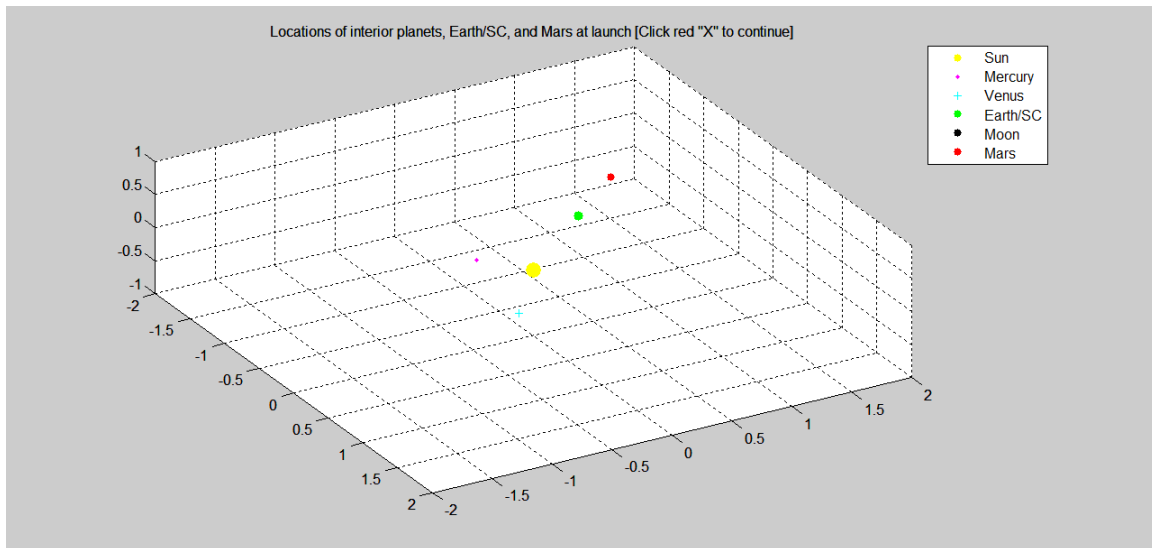


Figure 19: Sample Run Screen Shot – Interior Planet Locations at Launch

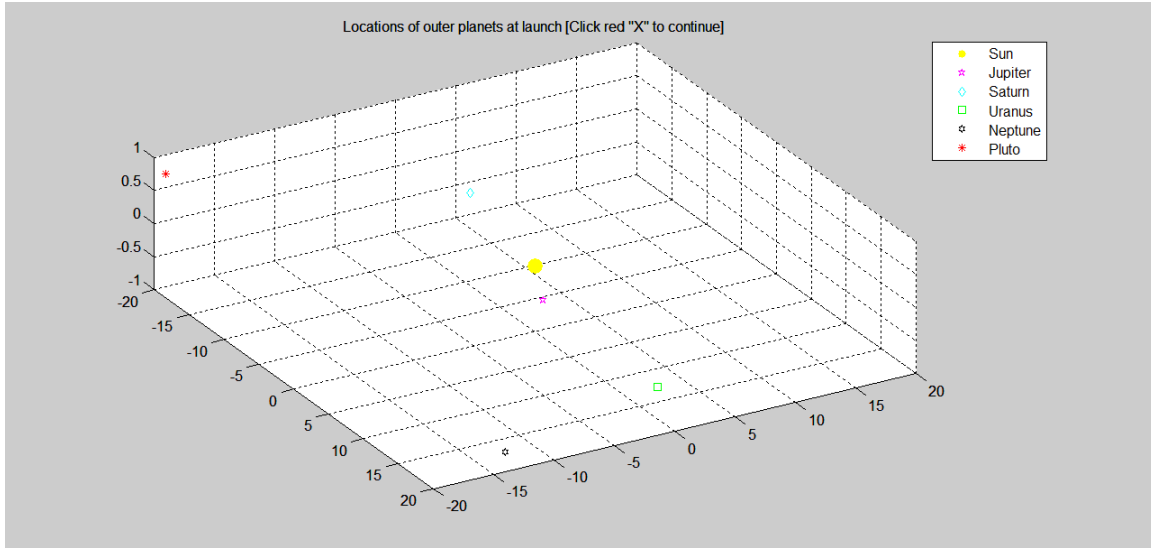


Figure 20: Sample Run Screen Shot – Outer Planet Locations at Launch

Figure 21 shows the locations of all objects that have solutions to the Gauss problem and the locations of Earth, the Moon, and Mars for the arrival date, or the date that is the launch date plus the time-of-flight.

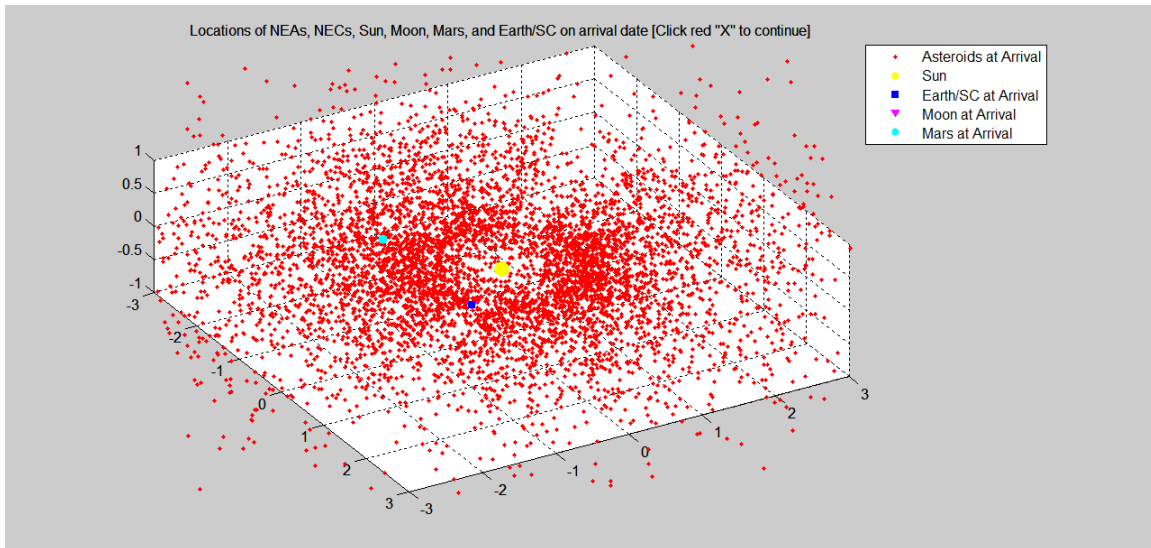


Figure 21: Sample Run Screen Shot – NEOs, Earth, Moon, Mars at Arrival

Figure 22 shows the plot containing the locations of the Earth at launch and arrival, the locations of the spacecraft at launch and arrival and its transfer trajectory, and the locations of the first object visited at launch and arrival and its orbital trajectory between these times.

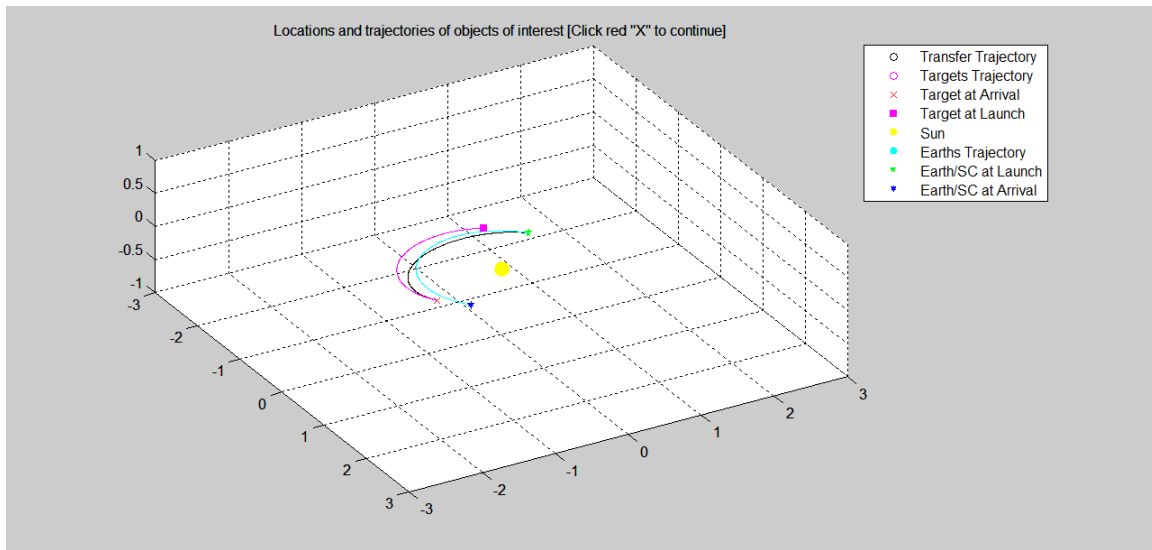


Figure 22: Sample Run Screen Shot – First Object, Earth, and Trajectories

Figure 23 below shows the parameters for the follow-on object chosen.

```

MATLAB 7.7.0 (R2008b)
File Edit Debug Parallel Desktop Window Help
Current Directory: C:\Users\Uriah Tobey\Documents\MATLAB
Shortcuts How to Add What's New

2011      1      30
Arrival: Year Month Day:
ans =
2011      8      1
ans =
Total number of travel days:
183
Total number of solutions with velocity differences within tolerance:
count_vel =
21
Total number of these solutions with period differences also within tolerance:
count_T_diff =
21
Best Object to visit: [Object #]
ilow =
4877
Vector of: [Hyperbolic Excess Speed; Flyby Speed; Characteristic Velocity Required]
[Difference between periods; Velocity Difference; Period; J-score]
ans =
7.54083914618019
3.26853501688929
0.0687142563540344
0.61549757940611
0.0359072955135323
364.384502420594
1.18586944515585
Start Paused: Press any key
OVR

```

Figure 23: Sample Run Screen Shot – Output of Potential Follow-on Objects

Finally, the next figure shows the plot of locations and trajectories for the follow-on object, which are developed similarly to that of the first object. This is representative for object number 782 (see Appendix A), which is chosen as the first follow-on object.

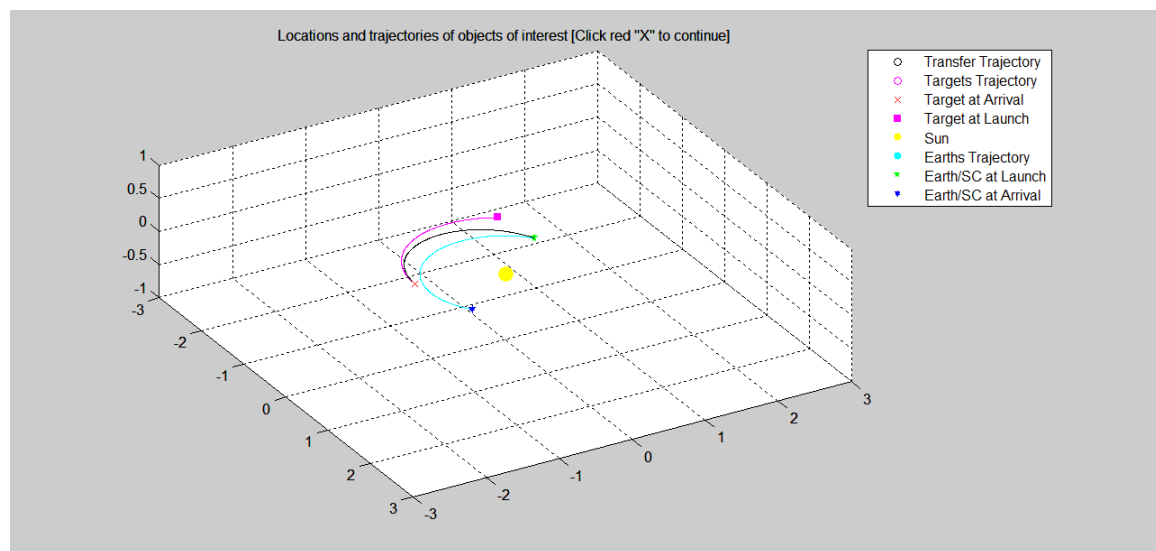


Figure 24: Sample Run Screen Shot – Second Object, Earth, and Trajectories

The code then continues to move forward, search for acceptable follow-on trajectories, and provide their plots. Figure 25 shows the orbits of the spacecraft to visit 16 asteroids between 2010 and 2025.

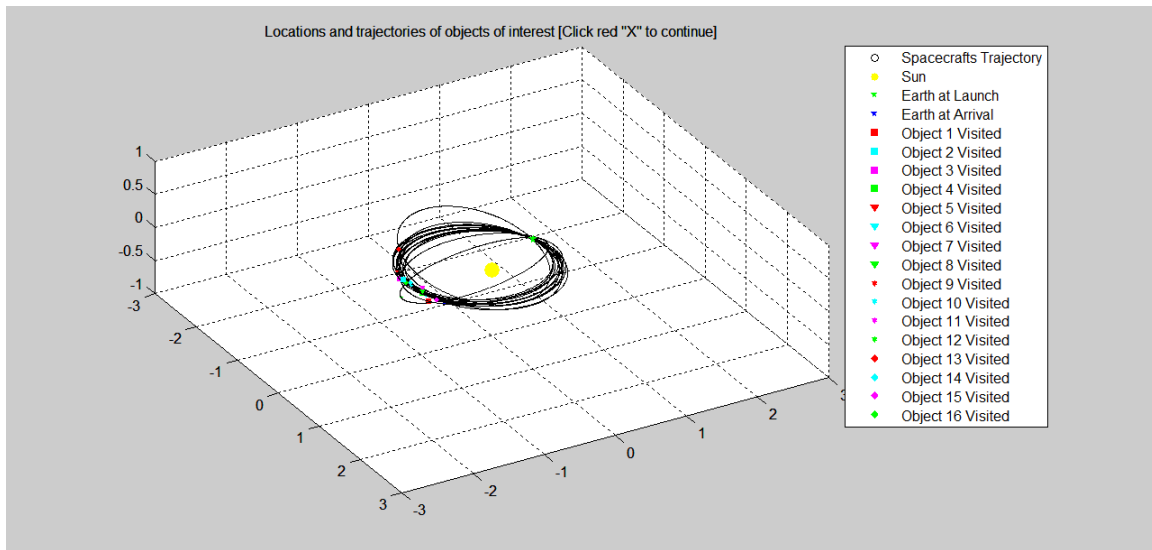


Figure 25: Sample Run Screen Shot – 16 Transfer Trajectories

Table 7 below shows detailed information on the velocities, fuel masses used, J-scores, and dates involved for the optimal run found of launching on January 31, 2010.

Table 7: Results for Optimal Run

#	Launch / Earth Swingby	Object Arrival	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	31-Jan-10	2-Aug-10	782	961.15	193.19	5.87	5.09	1.73
2	30-Jan-11	1-Aug-11	4877	68.71	11.82	7.54	3.27	1.19
3	29-Jan-12	30-Jul-12	3361	25.94	4.43	8.33	6.92	1.28
4	27-Jan-13	29-Jul-13	3877	3.51	0.60	3.82	3.03	0.62
5	26-Jan-14	28-Jul-14	5879	28.05	4.79	1.81	3.61	0.56
6	26-Jan-15	28-Jul-15	2938	49.62	8.50	3.10	6.10	0.85
7	25-Jan-16	26-Jul-16	3430	13.64	2.32	6.21	4.15	0.98
8	23-Jan-17	25-Jul-17	4569	22.53	3.84	3.51	14.60	1.63
9	23-Jan-18	25-Jul-18	4245	15.95	2.72	8.25	4.50	1.21
10	22-Jan-19	24-Jul-19	2113	37.75	6.46	4.73	8.89	1.30
11	21-Jan-20	22-Jul-20	2636	53.85	9.24	5.28	4.65	0.88
12	19-Jan-21	21-Jul-21	5161	42.35	7.25	14.87	5.51	1.93
13	19-Jan-22	21-Jul-22	1300	51.21	8.78	12.65	9.49	2.05
14	19-Jan-23	21-Jul-23	3422	33.87	5.79	5.66	8.86	1.37
15	18-Jan-24	19-Jul-24	2946	56.70	9.73	2.12	9.38	1.09
16	17-Jan-25	19-Jul-25	6055	84.91	14.64	5.37	12.50	1.77
*Assumed an $I_{sp} = 300$ s and $m_d = 500$ kg			Totals:	1549.74	294.09	99.11	110.54	20.44

Table 8 compares the results of this study with those found by Barbee, Davis, and Hur-Diaz in 2009. One will see that the methods presented in this research have potential savings in fuel per object used, but the timeframe is greater. Their approach results in around four asteroid visits per year where this research only sees one object per year. The fuel mass per object in this study is around 20 kg per object on average using a conservative I_{sp} of 300 seconds and a conventional thrust device. The study conducted by Barbee, et al. utilizes around 23 kg of fuel per object on average utilizing a constant, low-thrust device with an estimated I_{sp} of 3000 seconds. To be able to compare the results, an overall spacecraft mass and dry mass of 1500 and 500 kg were used respectively for each study. The plots of each object's flyby for this optimal run are shown in Appendix I.

Appendix J contains tables similar to Table 7 along with 16-year trajectory plots for the other dates tested using these methods.

The approach presented here might present equivalent objects visited per year if one utilizes Mercury or Venus as the focus of the gravity assists instead of Earth. This would allow a visit of an object for every year of one of these inner planets, which would equate to multiple visits per Earth year. This might result in the possibility of visiting as many objects as allowed by a constant-thrust device with the benefits of fuel-savings by utilizing planet gravity assists. This research shows that such a study could be worthwhile.

Table 8: Comparison of Results

Asteroid	Asteroid	Segment Type	Segment Type	Date	Date	Spacecraft Mass (kg)	Spacecraft Mass (kg)	Δm (kg)*	Δm (kg)**	ΔV (m/s)*	ΔV (m/s)**	
-	-	-	Launch	-	31-Jan-10	1500	1500	-	-	-	-	
-	164202 (2004EW)	-	Flyby	-	2-Aug-10	-	1306.81	-	193.19	-	961.15	
-	2007UD6	-	Flyby	-	1-Aug-11	-	1294.99	-	11.82	-	68.71	
-	2005HN3	-	Flyby	-	30-Jul-12	-	1290.56	-	4.43	-	25.94	
-	2006CT	-	Flyby	-	29-Jul-13	-	1289.97	-	0.60	-	3.51	
-	2009BD	-	Flyby	-	28-Jul-14	-	1285.18	-	4.79	-	28.05	
-	2004MO4	-	Flyby	-	28-Jul-15	-	1276.67	-	8.50	-	49.62	
-	2005ML13	-	Flyby	-	26-Jul-16	-	1274.35	-	2.32	-	13.64	
-	2007FR3	-	Flyby	-	25-Jul-17	-	1270.51	-	3.84	-	22.53	
-	2006UB17	-	Flyby	-	25-Jul-18	-	1267.79	-	2.72	-	15.95	
-	2002LT24	-	Flyby	-	24-Jul-19	-	1261.33	-	6.46	-	37.75	
162173	2003WE	Flyby	Flyby	30-Jan-21	22-Jul-20	-	1252.09	-	9.24	-	53.85	
140158	-	Flyby	-	8-Jun-21	-	1436.28	1252.09	63.72	0	3529.0	0	
2008EE9	2008CQ116	Flyby	Flyby	6-Sep-21	21-Jul-21	1387.36	1244.84	48.92	7.25	2746.4	42.35	
1983LC	-	Flyby	-	22-Oct-21	-	1372.46	1244.84	14.90	0	863.8	0	
2000QV7	-	Flyby	-	1-Feb-22	-	1312.76	1244.84	59.70	0	3318.1	0	
2003JO14	-	Flyby	-	24-May-22	-	1265.08	1244.84	47.68	0	2679.8	0	
2007YF	1999LE6	Flyby	Flyby	6-Sep-22	21-Jul-22	1238.01	1236.07	27.07	8.78	1551.2	51.21	
2006RJ1	-	Flyby	-	1-Dec-22	-	1204.41	1236.07	33.60	0	1913.7	0	
2001SY169	-	Flyby	-	9-Feb-23	-	1200.83	1236.07	3.57	0	209.5	0	
2003GX	-	Flyby	-	19-Apr-23	-	1180.35	1236.07	20.48	0	1181.2	0	
2005YP180	2005MR1	Flyby	Flyby	7-Jul-23	21-Jul-23	1156.60	1230.28	23.75	5.79	1365.1	33.87	
2003LH	-	Flyby	-	6-Oct-23	-	1147.39	1230.28	9.21	0	537.1	0	
22753	-	Flyby	-	17-Jan-24	-	1139.76	1230.28	7.63	0	445.8	0	
1991FB	-	Flyby	-	29-Mar-24	-	1133.07	1230.28	6.69	0	390.8	0	
2005BG28	2004NU7	Flyby	Flyby	17-Jul-24	19-Jul-24	1090.92	1220.55	42.15	9.73	2381.2	56.70	
2007XH16	-	Flyby	-	6-Nov-24	-	1076.02	1220.55	14.90	0	863.9	0	
153002	-	Flyby	-	6-Mar-25	-	1019.52	1220.55	56.50	0	3149.9	0	
2003YG136	-	Flyby	-	2-May-25	-	972.62	1220.55	46.90	0	2637.6	0	
2007VB138	2009FH	Flyby	Flyby	7-Aug-25	19-Jul-25	956.15	1205.91	16.47	14.64	953.5	84.91	
2007DJ8	-	Flyby	-	29-Nov-25	-	946.00	1205.91	10.15	0	591.0	0	
2008GF1	-	Flyby	-	28-Jan-26	-	915.64	1205.91	30.36	0	1734.1	0	
2004FD	-	Flyby	-	9-Apr-26	-	907.27	1205.91	8.38	0	488.8	0	
1994WR12	-	Flyby	-	24-Jul-26	-	893.05	1205.91	14.22	0	825.0	0	
2008EL85	-	Flyby	-	14-Nov-26	-	883.58	1205.91	9.46	0	551.7	0	
2001BA16	-	Flyby	-	8-Mar-27	-	863.14	1205.91	20.44	0	1178.9	0	
2004KZ	-	Flyby	-	2-Jul-27	-	847.59	1205.91	15.55	0	900.9	0	
2007CR5	-	Flyby	-	1-Oct-27	-	790.15	1205.91	57.45	0	3199.6	0	
2008TP26	-	Flyby	-	22-Nov-27	-	776.82	1205.91	13.32	0	773.7	0	
2005XN27	-	Flyby	-	13-Mar-28	-	768.68	1205.91	8.15	0	475.4	0	
2005UH6	-	Flyby	-	5-Jul-28	-	757.83	1205.91	10.85	0	631.5	0	
1998DK36	-	Flyby	-	1-Oct-28	-	748.30	1205.91	9.53	0	555.4	0	
175706	-	Flyby	-	12-Dec-28	-	722.53	1205.91	25.77	0	1478.4	0	
4769	-	Flyby	-	3-Mar-29	-	698.91	1205.91	23.62	0	1358.2	0	
2008TS26	-	Flyby	-	8-May-29	-	684.55	1205.91	14.36	0	833.2	0	
175729	-	Flyby	-	1-Sep-29	-	677.36	1205.91	7.18	0	419.5	0	
2000SZ162	-	Flyby	-	30-Dec-29	-	659.04	1205.91	18.32	0	1058.9	0	
141851	-	Flyby	-	25-Feb-30	-	651.13	1205.91	7.91	0	461.6	0	
2001UO	-	Flyby	-	10-May-30	-	636.50	1205.91	14.63	0	848.7	0	
1997US2	-	Flyby	-	25-Jun-30	-	630.49	1205.91	6.01	0	351.8	0	
2005CN	-	Rendezvous	-	27-Oct-30	-	581.30	1205.91	49.19	0	2760.5	0	
Barbee, Davis, and Hur-Diaz Research				Results of this Research		Totals:	581.3	1205.91	918.7	294.09	52194	1550
*I _{sp} = 3000 s and m _d = 500 kg						**I _{sp} = 300 s and m _d = 500 kg						

V. Conclusions and Recommendations

Conclusions of Research

The goal of this research was to develop computer code to approach the problem of finding solutions to the multiple NEO rendezvous problem utilizing Earth gravity assists. This code was successfully developed, but only a few dozen potential launch dates were tested out of the thousands of possibilities. Extensively searching the associated solution space was not possible in the given time. The code results do validate the theory presented as far as checking the soundness of the equations presented and this approach to performing NEO rendezvous.

Recommendations for Future Research

One could take this research further simply by sitting down and running the code repeatedly with varied launch dates to see if elegant solution sets result. Alternatively, one might further develop the code so that this is automatically accomplished. Now that the foundation for this approach is in place, one might also add in some perturbing forces and numerically integrate the equations of motion to see how that affects the solutions. One might also adapt this approach to include the dynamics seen by a constant, low-thrust propulsion device. One might also search for results using Mercury or Venus as the focus for the gravity assists as mentioned above. There is still plenty of research available in this field, which is why it is an active research area. This research will hopefully enable others to further their understanding of the problem at hand and open up new approaches to finding solutions to the multiple rendezvous problem.

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Appendix A: Asteroid Ephemerides

#	Object	Epoch	a	e	i	w	Node	M
1	433 Eros	55200	1.45810456	0.222789285	10.8293168	178.7591201	304.3716084	303.6777988
2	719 Albert	55200	2.62752161	0.552836242	11.5608107	155.816635	184.0614049	344.0968609
3	887 Alinda	55200	2.47904577	0.566879889	9.3528908	350.3276666	110.5632383	54.5322917
4	1036 Ganymed	55200	2.66471038	0.534029002	26.6858095	132.5319341	215.5608387	222.7367905
5	1221 Amor	55200	1.92034105	0.43427777	11.8771158	26.4875627	171.3906155	70.3427996
6	1566 Icarus	55200	1.077815	0.82694347	22.8367589	31.3393411	88.047357	85.8305911
7	1580 Betulia	55200	2.19649431	0.487668554	52.0919463	159.5291182	62.3128951	124.6415584
8	1620 Geographos	55200	1.24558909	0.335456321	13.3379821	276.813381	337.2636996	60.5436191
9	1627 Ivar	55200	1.86344806	0.396863317	8.4483764	167.6439577	133.1922823	223.9302907
10	1685 Toro	55200	1.36730606	0.435829085	9.3794982	127.0669189	274.3326045	107.8652642
11	1862 Apollo	55200	1.4702437	0.559937741	6.3529887	285.8487539	35.7389189	147.5403095
12	1863 Antinous	55200	2.25947037	0.606622961	18.4006629	268.0499699	346.5512698	46.435941
13	1864 Daedalus	55200	1.46090373	0.614641025	22.1999543	325.5568612	6.6930291	260.1978965
14	1865 Cerberus	55200	1.07996528	0.4670267	16.0936536	325.2042353	212.9670793	266.3990208
15	1866 Sisypheus	55200	1.89373754	0.5386508	41.1831033	293.0332136	63.5819082	106.877041
16	1915 Quetzalcoatl	55200	2.54162154	0.571634628	20.417068	347.8590704	162.9905097	52.2571115
17	1916 Boreas	55200	2.27373778	0.449072932	12.8774098	335.8428225	340.739797	166.5114067
18	1917 Cuyo	55200	2.15062796	0.504198964	23.9402838	194.3705029	188.3493613	146.7422518
19	1943 Anteros	55200	1.43009212	0.255892948	8.7043664	338.2658677	246.3845061	158.9009452
20	1980 Tezcatlipoca	55200	1.70969837	0.364894882	26.857565	115.378919	246.6440683	174.0333531
21	1981 Midas	55200	1.77591059	0.650017163	39.837582	267.7736431	356.9986632	170.4334876
22	2059 Baboquivari	55200	2.64424658	0.530026053	11.0393876	191.2114916	201.0123889	256.4959105
23	2061 Anza	55200	2.26508171	0.537294129	3.7721984	156.4689437	207.6284583	162.6008228
24	2062 Aten	55200	0.96653745	0.182616771	18.9331977	147.9512555	108.6212249	139.439149
25	2063 Bacchus	55200	1.0781377	0.349502637	9.4333009	55.2614355	33.1434169	167.6115861
26	2100 Ra-Shalom	55200	0.83209827	0.436520211	15.7590348	356.0203045	170.8565289	277.0381322
27	2101 Adonis	55200	1.87436683	0.763968318	1.3338669	43.1040091	349.9669101	316.8559228
28	2102 Tantalus	55200	1.28997888	0.298997438	64.0063288	61.5738384	94.3801829	45.8281066
29	2135 Aristaeus	55200	1.59938305	0.503314731	23.0569631	290.8470634	191.259432	91.622457
30	2201 Oljato	55200	2.17470919	0.713205961	2.5140899	96.4659742	76.4400226	115.9680329
31	2202 Pele	55200	2.2901796	0.511955964	8.7415484	217.8963689	170.0210982	260.6552886
32	2212 Hephaistos	55200	2.16709367	0.833816102	11.7363743	208.5590847	28.274875	310.8360897
33	2329 Orthos	55200	2.403743	0.657526162	24.4357046	145.8576104	169.4386214	341.542726
34	2340 Hathor	55200	0.84424791	0.449735798	5.8546946	39.9991988	211.4948846	28.7132766
35	2368 Beltrovata	55200	2.10499589	0.41385078	5.2357139	42.6456375	287.5821588	216.3136395
36	2608 Seneca	55200	2.50364835	0.576161021	14.9914609	35.6552629	168.4653574	22.7350658
37	3102 Krok	55200	2.15136803	0.448489635	8.4197455	154.4659756	172.2470803	355.1823522
38	3103 Eger	55200	1.40486667	0.354399505	20.932594	253.941361	129.8241328	346.0901182
39	3122 Florence	55200	1.76848934	0.422934651	22.1646891	27.6913252	336.1482603	258.0867591
40	3199 Nefertiti	55200	1.57431479	0.283977144	32.9710922	53.3583452	340.044943	265.0497756
41	3200 Phaethon	55200	1.27114046	0.889916694	22.1831203	322.0156318	265.3926218	135.9639052
42	3271 Ul	55200	2.10168517	0.395748737	25.0396843	158.8920128	158.9220321	357.816309
43	3288 Seleucus	55200	2.03225735	0.457529127	5.9338677	349.247688	218.7070564	204.9787255
44	3352 McAuliffe	55200	1.87854889	0.369636816	4.7740683	15.8967669	107.419808	81.5237428
45	3360 Syrinx	55200	2.46733334	0.743764895	21.4161968	62.1033686	244.0020354	116.651378
46	3361 Orpheus	55200	1.20982693	0.322989282	2.6845251	301.6977098	189.5496543	345.7442662
47	3362 Khufu	55200	0.9894287	0.468544877	9.9187178	54.9888662	152.4882183	352.7315044
48	3551 Verenia	55200	2.09276185	0.486986824	9.5063955	193.1856679	173.8758902	245.057539
49	3552 Don Quixote	55200	4.22492397	0.713880304	30.9693055	317.1044776	350.2673175	13.3237262
50	3553 Mera	55200	1.64450625	0.320434282	36.7658754	288.8919041	232.564771	286.0171995
51	3554 Amun	55200	0.97378079	0.280496936	23.3627321	359.3911924	358.6598557	87.911059
52	3671 Dionysus	55200	2.19831472	0.541781635	13.542996	204.2529406	82.18292	298.7664784
53	3691 Bede	55200	1.77418858	0.284061241	20.3718982	234.757465	348.8332641	253.5125786
54	3752 Camillo	55200	1.41349894	0.301926252	55.5594641	312.227062	147.9917657	81.6459657
55	3753 Cruithne	55200	0.9976711	0.514945991	19.8103101	43.7561023	126.2809785	8.1692141
56	3757 (1982 XB)	55200	1.83501702	0.445282449	3.8680064	17.1278949	74.9909748	312.193545
57	3838 Epona	55200	1.50483041	0.702025206	29.2354796	49.5928389	235.6121799	222.870875
58	3908 Nyx	55200	1.9272816	0.458816058	2.1813112	126.2227862	261.5191857	337.0783548
59	3988 (1986 LA)	55200	1.54482682	0.31685917	10.7677597	86.751911	229.9164463	63.739889
60	4015 Wilson-Harrington	55200	2.63832404	0.624333507	2.7854145	91.2496918	270.5507686	17.0098977
61	4034 (1986 PA)	55200	1.05951064	0.443942445	11.1704529	296.603234	158.0140228	61.0434555

#	Object	Epoch	a	e	i	w	Node	M
62	4055 Magellan	55200	1.82038742	0.326238183	23.2459313	154.2785056	164.8982653	260.3185795
63	4179 Toutatis	55200	2.53091964	0.628809126	0.4463207	278.7066333	124.3200119	103.761295
64	4183 Cuno	55200	1.98190736	0.636028119	6.749614	235.4377328	295.6376588	70.3128491
65	4197 (1982 TA)	55200	2.29999459	0.771854291	12.5494453	122.2349134	7.31966	267.2528154
66	4257 Ubasti	55200	1.64696625	0.468421311	40.7154897	278.9294147	169.2453084	163.1212962
67	4341 Poseidon	55200	1.8346251	0.679786518	11.8583335	15.6361381	108.1452429	63.0193698
68	4401 Aditi	55200	2.58164347	0.564745664	26.6438937	68.0629371	22.9923881	289.9226699
69	4450 Pan	55200	1.44252229	0.586467084	5.5168308	291.5917191	312.0097654	359.7136581
70	4486 Mithra	55200	2.20421759	0.660354284	3.0336286	168.8219022	82.3181413	326.5601339
71	4487 Pochahontas	55200	1.73012834	0.296656538	16.4037882	173.8475671	198.1773225	277.8095595
72	4503 Cleobulus	55200	2.70207484	0.525156794	2.5153461	76.3846621	46.0997445	171.5243493
73	4544 Xanthus	55200	1.04181602	0.25007337	14.1452122	333.714095	24.0286774	30.1473503
74	4581 Asclepius	55200	1.02248448	0.356955729	4.9131037	255.2251534	180.3693287	104.323845
75	4587 Rees	55200	2.65340823	0.511464923	24.6368058	83.8216039	180.6287775	178.673144
76	4596 (1981 QB)	55200	2.24006623	0.518654476	37.1012508	248.3357829	154.3366646	142.1728405
77	4660 Nereus	55200	1.4884725	0.3601734	1.4327045	157.970442	314.5029358	140.0382356
78	4688 (1980 WF)	55200	2.2341086	0.515313119	6.3784681	213.4332435	241.4483529	251.9695427
79	4769 Castalia	55200	1.06312548	0.483173657	8.8888583	121.334249	325.6353316	149.4672021
80	4947 Ninkasi	55200	1.36995957	0.16829791	15.6503964	192.8510241	215.4858528	65.568941
81	4953 (1990 MU)	55200	1.62107866	0.657463199	24.3910059	77.6786393	77.8139115	226.5887161
82	4954 Eric	55200	2.00124201	0.448722388	17.4499594	52.3943763	358.5621874	268.4579335
83	4957 Brucemurray	55200	1.56544116	0.219042909	35.0082969	97.4502214	254.9427185	131.2308666
84	5011 Ptah	55200	1.63551347	0.500309703	7.4067957	105.7054835	10.8238685	149.8843351
85	5131 (1990 BG)	55200	1.48618559	0.569361881	36.4028013	135.7642355	110.4499495	300.3435336
86	5143 Heracles	55200	1.83324327	0.772631646	9.1274408	226.9140165	310.275799	62.8433755
87	5189 (1990 UQ)	55200	1.55103447	0.478035386	3.5807457	159.5760697	135.376958	23.9916918
88	5324 Lyapunov	55200	2.96280653	0.614580771	19.4981707	320.190443	353.0687352	146.7740554
89	5332 Davidaguilar	55200	2.16308586	0.456526507	25.4725774	305.7980791	142.9656291	107.269162
90	5370 Taranis	55200	3.33621444	0.634393964	19.090546	161.2346488	177.8427351	293.8840864
91	5381 Sekhmet	55200	0.94749506	0.296142513	48.9678893	37.426871	58.5555083	188.0404097
92	5496 (1973 NA)	55200	2.43419726	0.636853095	68.0151858	118.123553	101.0759588	234.331418
93	5587 (1990 SB)	55200	2.39249104	0.547312561	18.0992577	86.3060032	190.3849303	109.4487783
94	5590 (1990 VA)	55200	0.98557446	0.279396591	14.1862073	34.4407392	216.3293567	346.7949084
95	5604 (1992 FE)	55200	0.92686572	0.405222356	4.7937121	82.4486301	311.965955	76.945505
96	5620 Jasonwheeler	55200	2.15802277	0.42385844	7.8621965	153.4806073	128.7732891	54.8871548
97	5626 (1991 FE)	55200	2.19522147	0.453961862	3.8540402	231.3476175	173.2990435	4.13051
98	5645 (1990 SP)	55200	1.35494939	0.387270875	13.5072864	48.1456288	45.8056651	29.6000102
99	5646 (1990 TR)	55200	2.14290994	0.436860829	7.9135695	335.6217132	14.1945881	58.8475381
100	5653 Camarillo	55200	1.79409801	0.304557822	6.8758748	122.5099529	10.0046105	9.3611316
101	5660 (1974 MA)	55200	1.7855944	0.762260404	38.0502601	126.868717	302.3493773	287.3071711
102	5693 (1993 EA)	55200	1.27129626	0.585292742	5.0553498	258.7749464	97.1265641	88.843134
103	5731 Zeus	55200	2.26221552	0.654075883	11.4378951	216.9785753	281.7508275	45.1302494
104	5751 Zao	55200	2.10277581	0.423741211	16.0731606	25.2792371	121.7190153	309.0287839
105	5786 Talos	55200	1.08147076	0.826930254	23.2455892	8.3168822	161.332793	225.2905061
106	5797 Bivoj	55200	1.89330953	0.44447926	4.1910099	168.3801247	299.0586632	187.260659
107	5828 (1991 AM)	55200	1.69756591	0.695562193	30.0953199	152.6854135	125.5020935	171.7621873
108	5836 (1993 MF)	55200	2.4443183	0.532932535	7.9807561	76.7325356	239.7326376	105.9003555
109	5863 Tara	55200	2.22064181	0.507381639	19.4750419	115.4217618	169.029366	359.7227216
110	5869 Tanith	55200	1.81221974	0.321157761	17.928185	230.6765012	227.9696781	210.9776102
111	5879 Almeria	55200	1.62484659	0.289206442	21.5758686	355.6528575	145.8985761	232.978481
112	6037 (1988 EG)	55200	1.270937	0.499434406	3.4948308	241.8602277	182.7002478	136.4236647
113	6047 (1991 TB1)	55200	1.45415985	0.352210828	23.4739065	103.7417282	6.1517593	88.0633846
114	6050 Miwablock	55200	2.20316015	0.435995596	6.4019293	284.6597953	88.41405	205.2810808
115	6053 (1993 BW3)	55200	2.14723628	0.528441598	21.5918845	74.7824142	318.4226885	190.4394526
116	6063 Jason	55200	2.21453612	0.76609289	4.916528	336.9844874	169.5234102	285.0755741
117	6178 (1986 DA)	55200	2.81108953	0.585621416	4.307981	127.1547566	64.7974019	10.2274596
118	6239 Minos	55200	1.15189268	0.412820285	3.9441821	239.6226655	344.6916942	236.8229057
119	6455 (1992 HE)	55200	2.23953315	0.572683658	37.3658168	262.5899362	27.1727761	83.1672679
120	6456 Golombek	55200	2.19393504	0.407841739	8.2084171	346.8902486	313.7640651	136.5229869
121	6489 Golevka	55200	2.49813212	0.605103506	2.2761244	66.9312116	210.8908142	237.3246096
122	6491 (1991 OA)	55200	2.50263682	0.589000172	5.7353033	320.6425791	304.0850091	250.5613671
123	6569 Ondaatje	55200	1.6261218	0.220727245	22.6379323	167.2322752	111.5335497	342.5581859
124	6611 (1993 VW)	55200	1.69550579	0.485180568	8.691194	281.1750481	231.0821667	65.7066424
125	7025 (1993 QA)	55200	1.47600612	0.314990642	12.606283	323.3706255	146.6724754	286.2286752
126	7088 Ishtar	55200	1.9802648	0.390900018	8.3024287	354.6869657	102.7195983	162.8484511

#	Object	Epoch	a	e	i	w	Node	M
127	7092 Cadmus	55200	2.53117596	0.701248334	17.7568446	92.9405014	58.7044261	153.6799493
128	7236 (1987 PA)	55200	2.72592	0.558913836	16.323302	337.9964199	308.5666924	3.10043
129	7335 (1989 JA)	55200	1.77090258	0.484169465	15.209762	232.0923296	61.4432032	250.7539994
130	7336 Saunders	55200	2.30562964	0.479792474	7.1717332	181.1055054	174.5848918	286.5050932
131	7341 (1991 VK)	55200	1.8420309	0.506708406	5.4230173	173.3746262	294.9346013	68.6174752
132	7350 (1993 VA)	55200	1.35579635	0.391105749	7.2618511	336.5560017	133.1775897	52.7412326
133	7358 Oze	55200	2.19831265	0.502948271	4.6570151	91.3239501	266.1317304	159.5155724
134	7474 (1992 TC)	55200	1.56550027	0.292314595	7.0881114	275.5116197	88.683464	292.8419818
135	7480 Norwan	55200	1.567536	0.317028784	9.4545658	256.723541	124.4489496	266.9606751
136	7482 (1994 PC1)	55200	1.34614223	0.32830482	33.4934427	47.566747	117.9304619	80.758787
137	7753 (1988 XB)	55200	1.4675476	0.481870969	3.1244167	279.9867132	73.5019027	342.1045675
138	7822 (1991 CS)	55200	1.12271573	0.164597896	37.1230247	249.4163447	156.8853855	28.8875138
139	7839 (1994 ND)	55200	2.16504161	0.517995494	27.1821123	228.0106851	102.7216518	297.9711219
140	7888 (1993 UC)	55200	2.43416468	0.664212182	26.0774217	323.0476629	165.9629512	63.5825073
141	7889 (1994 LX)	55200	1.26151362	0.346337464	36.9071521	349.125706	111.3069283	180.7956878
142	7977 (1977 QQ5)	55200	2.22583151	0.465704463	25.175812	248.0301305	134.2697083	250.9077684
143	8013 Gordonmoore	55200	2.20058869	0.430449579	7.5653029	146.7619383	105.6765602	359.8722715
144	8014 (1990 MF)	55200	1.74625492	0.455818015	1.863937	114.1584839	210.4338601	145.9706699
145	8034 Akka	55200	1.830288	0.409058648	2.0238963	68.0063789	233.0206401	15.3763222
146	8035 (1992 TB)	55200	1.34171717	0.462343021	28.3133884	5.9927616	185.6689282	189.8779238
147	8037 (1993 HO1)	55200	1.98611022	0.418185003	5.909844	105.7113764	22.5001739	30.1519341
148	8176 (1991 WA)	55200	1.57467765	0.642895727	39.6237238	241.8298834	66.6352994	87.6950917
149	8201 (1994 AH2)	55200	2.5342271	0.708397342	9.5767199	25.0263786	164.1942141	322.3796903
150	8507 (1991 CB1)	55200	1.68663903	0.594816371	14.5853082	345.6671675	317.478589	100.5653495
151	8566 (1996 EN)	55200	1.50631684	0.430682244	37.966937	125.1060045	164.1832798	91.3881076
152	8567 (1996 HW1)	55200	2.04625692	0.448968932	8.4384133	177.0611532	177.1815593	160.7028659
153	9058 (1992 JB)	55200	1.55648905	0.359886016	16.0727996	306.8586875	218.4233761	64.3880642
154	9162 Kwiila	55200	1.49622135	0.595199769	9.0154632	235.6158458	180.1711614	49.6540696
155	9172 Abhramu	55200	2.7075485	0.553882445	7.8443982	74.0580483	287.7784625	203.1721297
156	9202 (1993 PB)	55200	1.42364482	0.607484004	40.8501455	212.2758009	315.9742361	332.322459
157	9400 (1994 TW1)	55200	2.58968475	0.577929941	36.0359286	62.0872349	3.5287067	214.0204544
158	9856 (1991 EE)	55200	2.24692096	0.622746285	9.7734312	115.2909368	168.9306818	171.5904366
159	9950 ESA	55200	2.44011659	0.530807007	14.5873509	103.0771113	253.918922	14.1248554
160	10115 (1992 SK)	55200	1.24855898	0.324761712	15.3247554	233.5490633	8.9710571	229.2098789
161	10145 (1994 CK1)	55200	1.90150997	0.63220063	4.5578797	27.1731567	328.6038017	117.8064654
162	10150 (1994 PN)	55200	2.37600078	0.542094421	45.970981	234.0219901	113.0880779	54.0423368
163	10165 (1995 BL2)	55200	1.23460916	0.503786661	23.895961	348.3985047	312.4807409	172.2838201
164	10302 (1989 ML)	55200	1.27251192	0.136670541	4.377808	183.2570937	104.3970821	98.620683
165	10563 Izhdubar	55200	1.00683452	0.266442588	63.4608698	132.1916852	56.5735203	238.9854159
166	10636 (1998 QK56)	55200	1.88335958	0.513266571	13.5618939	286.1028701	173.1371727	101.1086116
167	10860 (1995 LE)	55200	2.58285914	0.572248576	4.1474705	75.2847172	257.4926389	171.2447046
168	11054 (1991 FA)	55200	1.97938665	0.446976566	3.0784444	91.9882081	339.3207637	322.5934027
169	11066 Sigurd	55200	1.39158643	0.375223005	36.8891089	21.9370506	349.2679616	72.9253984
170	11284 Belenus	55200	1.74085667	0.337327892	1.993141	170.90231	311.8519905	246.059345
171	11311 Peleus	55200	2.11770067	0.535747321	25.4246529	313.0865877	59.5506447	99.1569299
172	11398 (1998 YP11)	55200	1.72048278	0.388659292	15.0322027	74.4589231	144.9204398	269.2304565
173	11405 (1999 CV3)	55200	1.45944713	0.393678635	22.8613512	96.2703843	141.3607843	15.5695242
174	11500 Tomaiyowit	55200	1.0797856	0.355961555	10.3084654	289.3802061	234.4891932	260.2726813
175	11885 (1990 SS)	55200	1.70273554	0.474905689	19.4146115	116.0042057	359.9332494	185.4073443
176	12538 (1998 OH)	55200	1.54153104	0.406139261	24.5136035	321.6077117	220.8025788	56.4643043
177	12711 Tukmit	55200	1.18637529	0.27231377	38.484266	322.8531474	295.0117719	132.3644909
178	12923 Zephyr	55200	1.96167524	0.491675394	5.2903287	146.7845723	168.3579528	275.2909963
179	13553 (1992 JE)	55200	2.19062958	0.462458277	5.8702416	109.6319861	193.7732094	130.6336495
180	13651 (1997 BR)	55200	1.33567001	0.305652376	17.244699	133.758362	116.7279227	54.1481313
181	14402 (1991 DB)	55200	1.71571629	0.40210945	11.4216301	51.2451039	158.3239981	116.3672176
182	14827 Hypnos	55200	2.84428234	0.664993805	1.9809296	238.1229573	58.0268455	350.5651141
183	15745 (1991 PM5)	55200	1.71952821	0.255134762	14.4238024	140.4792223	132.6880117	84.3329191
184	15817 Lucianotesi	55200	1.32472169	0.118201718	13.8727167	94.2957123	162.5411167	88.9914351
185	16064 (1999 RH27)	55200	2.85227553	0.588356535	4.5368723	104.6908374	335.7168088	17.3812373
186	16636 (1993 QP)	55200	2.3076855	0.469736738	7.2463563	46.6177154	297.2677239	238.1135172
187	16657 (1993 UB)	55200	2.27548248	0.461461071	24.984241	21.1493636	31.3417696	247.0509965
188	16816 (1997 UF9)	55200	1.44225586	0.604213371	25.899655	157.853661	37.22075	263.3824872
189	16834 (1997 WU22)	55200	1.46781221	0.442126457	15.9814442	334.2164127	260.8565324	134.9615053
190	16912 Rhiannon	55200	1.75144313	0.27246327	24.5258515	221.1117062	169.2454939	148.2796926
191	16960 (1998 QS52)	55200	2.20135586	0.858752125	17.6258412	242.453683	261.0164198	119.9628566

#	Object	Epoch	a	e	i	w	Node	M
192	17181 (1999 UM3)	55200	2.37623181	0.672378452	10.6545904	36.6140731	113.6908109	258.9510688
193	17182 (1999 VU)	55200	1.38703136	0.5535185	9.2821359	203.0347791	333.5975948	7.8111664
194	17188 (1999 WC2)	55200	2.21600248	0.638162882	29.3840825	286.8704767	270.2425873	359.5073426
195	17274 (2000 LC16)	55200	2.72206811	0.559183737	5.6293797	20.8313721	306.1615907	29.6445711
196	17511 (1992 QN)	55200	1.19018105	0.359081893	9.5887987	202.2510146	355.993005	230.512268
197	18106 Blume	55200	2.44499264	0.512245533	4.2196944	234.9747343	109.290984	159.3609195
198	18109 (2000 NG11)	55200	1.88074205	0.367856669	0.8097951	319.2159161	59.4657255	214.3582824
199	18172 (2000 QL7)	55200	2.4259461	0.509487516	17.8338666	100.6293001	338.6491938	133.2523196
200	18736 (1998 NU)	55200	2.35898941	0.487451403	2.8378264	221.3478681	298.5750081	165.9012078
201	18882 (1999 YN4)	55200	1.6853323	0.231624241	36.8171149	242.6418573	291.752179	136.8539096
202	19356 (1997 GH3)	55200	2.49449884	0.567582681	2.9927723	333.6395934	186.9133165	90.6282743
203	19764 (2000 NF5)	55200	2.23270559	0.444022546	1.3291441	9.4214873	281.7406186	311.5053452
204	20086 (1994 LW)	55200	3.19037044	0.616501636	22.3950108	56.1954411	239.5568358	260.0754176
205	20236 (1998 BZ7)	55200	2.03810129	0.556607486	6.4928823	103.6142195	111.9471453	11.3628352
206	20255 (1998 FX2)	55200	2.15077863	0.492442649	9.9629511	17.4778416	181.067933	259.0248426
207	20425 (1998 VD35)	55200	1.56503705	0.476539936	6.9785162	296.0651146	227.4432286	193.413253
208	20429 (1998 YN1)	55200	1.5558498	0.464377286	6.2980157	147.5035492	61.8056249	180.6847634
209	20460 Robwhiteley	55200	1.87713993	0.411853324	33.9351913	283.62566	280.1745666	73.4222976
210	20790 (2000 SE45)	55200	2.74129713	0.560756822	8.3293582	168.8129169	303.0166708	348.6167813
211	20826 (2000 UV13)	55200	2.4343526	0.627209868	32.0115023	198.1979981	347.5704883	123.7029076
212	21088 (1992 BL2)	55200	1.70659741	0.238332505	38.4613113	27.0495839	297.8927028	161.0458349
213	21277 (1996 TO5)	55200	2.37765392	0.519235087	20.9610462	167.4802465	250.1324625	195.1980707
214	21374 (1997 WS22)	55200	1.26953731	0.120553111	23.9811355	197.0787923	59.2524344	328.2701153
215	22099 (2000 EX106)	55200	1.1042198	0.276177758	9.844266	186.5301201	136.5069611	54.1124964
216	22753 (1998 WT)	55200	1.21878633	0.569804553	3.2048994	324.5762567	307.5760617	170.4216466
217	22771 (1999 CU3)	55200	1.57617897	0.52418559	11.3990848	305.6314443	339.111391	87.8483703
218	23183 (2000 OY21)	55200	1.82408562	0.401400996	40.9586113	301.4028841	119.7304158	238.8893925
219	23187 (2000 PN9)	55200	1.84620362	0.58970494	51.3091296	293.542736	164.4010439	206.7385175
220	23548 (1994 EF2)	55200	2.29193955	0.517344402	23.3619506	123.8327627	346.2357827	219.3670361
221	23606 (1996 AS1)	55200	1.74999984	0.360994776	14.360912	357.4156121	296.7115639	211.5063102
222	23714 (1998 EC3)	55200	2.12998968	0.514192374	8.3739634	128.4820356	128.2179169	251.3017819
223	24443 (2000 OG)	55200	2.30998346	0.822076965	25.8212515	230.9941278	178.3250531	231.8201366
224	24445 (2000 PM8)	55200	2.21109611	0.545017762	23.8602413	218.6181525	203.4099361	301.0826969
225	24475 (2000 VN2)	55200	1.97394883	0.441706164	14.6411882	32.6114907	76.5323429	95.8617221
226	24761 Ahau	55200	1.33500347	0.305879798	21.9201754	287.4531753	121.1181312	35.1810601
227	25143 Itokawa	55200	1.32405649	0.280108407	1.6219195	162.768624	69.0855044	249.6404632
228	25330 (1999 KV4)	55200	1.54071327	0.370737877	14.3267575	85.941551	50.6477793	225.5565955
229	25916 (2001 CP44)	55200	2.56211929	0.497650897	15.7397241	199.8608272	94.7513931	327.1369402
230	26166 (1995 QN3)	55200	3.30098186	0.644270974	14.7881395	62.9068505	185.7523953	163.7243197
231	26310 (1998 TX6)	55200	2.13976877	0.469890397	5.3688615	98.6174513	211.1050177	243.7691468
232	26379 (1999 HZ1)	55200	1.60565785	0.576217473	8.6893939	200.4478122	252.213784	144.6784597
233	26663 (2000 XK47)	55200	1.5458242	0.471998041	13.5439594	231.0083823	303.7686318	219.7866228
234	26760 (2001 KP41)	55200	2.87041962	0.550785893	10.908628	154.7453747	146.6377527	267.0468984
235	26817 (1987 QB)	55200	2.80923377	0.591978545	3.4877624	156.5493903	153.281121	282.9130959
236	27002 (1998 DV9)	55200	1.74351824	0.433867007	8.6996072	0.7304878	130.4268514	52.3834726
237	27031 (1998 RO4)	55200	2.13971931	0.425942529	5.3486639	111.7040319	192.0086838	241.9381239
238	27346 (2000 DN8)	55200	1.87511331	0.398717738	36.9461816	269.1986988	135.3055247	22.3565698
239	29075 (1950 DA)	55200	1.69899167	0.507394409	12.1815558	224.5229867	356.7763007	339.1207349
240	30825 (1990 TG1)	55200	2.43914848	0.679785447	8.7350602	33.7030316	205.0542704	81.0759533
241	30997 (1995 UO5)	55200	1.55998707	0.643646378	36.1756601	150.9736832	38.7359016	354.8961312
242	31210 (1998 BX7)	55200	2.60607692	0.501583217	8.956263	271.401799	145.0146821	331.4520185
243	31221 (1998 BP26)	55200	1.72292244	0.257118524	20.228656	186.5166177	331.099146	92.2420108
244	31345 (1998 PG)	55200	2.01539534	0.39161524	6.492875	155.8955493	222.8266548	331.0938196
245	31346 (1998 PB1)	55200	2.02891974	0.43056985	5.965891	350.2891748	299.8154106	347.8223907
246	31662 (1999 HP11)	55200	1.59701467	0.548014088	18.8024648	311.8756484	14.0556676	43.1262702
247	31669 (1999 JT6)	55200	2.13648692	0.578158162	9.5519917	38.9763082	78.9834726	193.4151384
248	32906 (1994 RH)	55200	2.24649914	0.440939557	18.9383491	92.2733236	331.3207102	162.5151601
249	33342 (1998 WT24)	55200	0.71845448	0.417922703	7.341936	167.2952126	81.9986691	291.5516319
250	34613 (2000 UR13)	55200	2.06781418	0.388734304	6.1699801	285.86009	315.4979813	152.1704034
251	35107 (1991 VH)	55200	1.13728921	0.14422307	13.9119595	206.8824867	139.3926285	32.6462498
252	35396 (1997 XF11)	55200	1.44242183	0.483957615	4.0979427	102.7761168	213.8899753	80.4056765
253	35432 (1998 BG9)	55200	2.51141113	0.540209352	13.0727987	1.3135609	115.4600177	359.3450894
254	35670 (1998 SU27)	55200	2.12319145	0.594559535	7.1079906	169.5297943	271.5114382	210.6212446
255	36017 (1999 ND43)	55200	1.5227141	0.313906794	5.5543238	51.9195525	332.2063915	159.6061208
256	36183 (1999 TX16)	55200	1.55137332	0.332669494	38.2130828	311.136528	54.7024879	133.8813825

#	Object	Epoch	a	e	i	w	Node	M
257	36236 (1999 VV)	55200	1.33249536	0.423376602	58.0391117	19.7308749	241.0934604	340.2996034
258	36284 (2000 DM8)	55200	1.48367341	0.554249845	46.7508283	317.9283062	323.2126133	63.7610244
259	37336 (2001 RM)	55200	2.25334602	0.484688693	36.6289833	117.9530856	223.7617707	175.8563838
260	37638 (1993 VB)	55200	1.90976964	0.519186779	5.0769317	323.0478033	145.7020451	20.4458568
261	37655 Illapa	55200	1.47806777	0.75238284	17.9947224	303.6663243	139.7470684	172.8062638
262	38071 (1999 GU3)	55200	2.08841983	0.507419631	12.7413325	8.7919011	195.5901142	200.1120631
263	38086 Beowolf	55200	1.42021229	0.5663926	23.670763	178.8707901	165.3708353	52.2424965
264	38091 (1999 JT3)	55200	2.1692082	0.401160687	9.358307	224.583478	65.0414892	81.9896936
265	38239 (1999 OR3)	55200	2.03336528	0.577106734	9.4830795	27.5972246	200.1960883	237.5243568
266	39557 Gielgud	55200	2.26391913	0.426405336	5.565351	239.3252663	58.8628848	32.0264142
267	39565 (1992 SL)	55200	1.6415427	0.334120192	8.5992031	344.6197355	1.0322871	86.3304345
268	39572 (1993 DQ1)	55200	2.03769625	0.492309236	10.0220162	344.7526406	313.663385	174.96609
269	39796 (1997 TD)	55200	2.24938039	0.469950153	12.928006	170.8017318	159.0178753	233.2698536
270	40263 (1999 FQ5)	55200	1.49496158	0.161031651	25.8454224	198.6143446	172.8604752	119.8298298
271	40267 (1999 GJ4)	55200	1.33875389	0.808234792	34.5438158	211.8521317	148.3057111	200.59264
272	40329 (1999 ML)	55200	2.26605223	0.453294311	2.5130634	111.0404636	211.6025388	20.8207451
273	41429 (2000 GE2)	55200	1.59243778	0.555034482	2.1936515	297.6260018	351.6207543	274.8639543
274	41440 (2000 HZ23)	55200	1.57581774	0.211333957	15.1070232	199.9628382	64.1165913	294.1349788
275	42286 (2001 TN41)	55200	1.41955986	0.391935315	24.0672095	150.8152495	55.888352	201.9768816
276	48603 (1995 BC2)	55200	1.9176389	0.429781911	5.029172	81.5657471	328.4344588	259.0522732
277	52340 (1992 SY)	55200	2.20960579	0.550034457	8.0469537	115.4819316	5.8650819	40.1547417
278	52381 (1993 HA)	55200	1.2782097	0.144023594	7.7252726	263.6851167	183.3570458	316.6000085
279	52387 (1993 OM7)	55200	1.28212727	0.189644309	24.152988	195.4882705	297.6293742	278.394445
280	52689 (1998 FF2)	55200	1.56174145	0.292160416	10.984838	265.0040279	4.7711648	316.528963
281	52750 (1998 KK17)	55200	1.42713764	0.524975086	11.1639465	334.056709	141.4023594	344.9677858
282	52760 (1998 ML14)	55200	2.41095788	0.620656824	2.4331413	20.1136241	338.913988	4.9036536
283	52761 (1998 MN14)	55200	1.55462196	0.224075495	19.4793271	350.3292662	259.0450619	355.9041761
284	52762 (1998 MT24)	55200	2.42103522	0.649906624	33.9608585	254.0104731	309.6746748	54.2224261
285	52768 (1998 OR2)	55200	2.39159685	0.566401933	5.8658804	173.7555775	27.278839	74.5604899
286	53110 (1999 AR7)	55200	1.64452377	0.214452593	40.6258047	58.2156992	85.4823547	31.6943502
287	53319 (1999 JM8)	55200	2.70666408	0.649547019	13.838895	166.3087689	133.8956009	122.7468783
288	53409 (1999 LU7)	55200	2.10138648	0.628668055	10.8065352	147.2548295	206.9991416	137.8375132
289	53426 (1999 SL5)	55200	1.92230194	0.538708719	22.8181259	43.1150719	239.2537169	331.9732279
290	53429 (1999 TF5)	55200	2.02390602	0.638365775	26.8155176	63.9164979	199.4112669	231.7793456
291	53430 (1999 TV16)	55200	2.09846623	0.404171666	60.4079646	156.8921928	241.9499284	139.5148825
292	53435 (1999 VM40)	55200	2.30992203	0.485413898	15.3860127	354.1823504	51.4646432	334.2633237
293	53550 (2000 BF19)	55200	1.49534072	0.419558251	7.17244	324.8070583	313.3141766	36.7587709
294	53789 (2000 ED104)	55200	1.37046414	0.268923374	40.7901867	218.3002198	190.0598889	160.0091228
295	54071 (2000 GQ146)	55200	1.32937565	0.197495851	23.4404154	128.2339701	36.3915632	160.2229716
296	54401 (2000 LM)	55200	1.71060586	0.262364658	18.9525002	66.9845961	240.9334686	78.4402286
297	54509 YORP	55200	1.00573592	0.230106841	1.599987	278.6927861	278.3680228	224.8159764
298	54660 (2000 UJ1)	55200	1.47688501	0.281006774	46.6835278	157.935814	223.744321	41.9059802
299	54686 (2001 DU8)	55200	1.77687767	0.341553284	33.2087776	265.8358656	161.7830148	320.0644512
300	54690 (2001 EB)	55200	1.6294104	0.256709394	35.3585732	99.5512115	33.5856026	116.3887968
301	54789 (2001 MZ7)	55200	1.77594196	0.287461607	24.4700133	19.9371606	130.144424	336.9894521
302	55408 (2001 TC2)	55200	1.09985847	0.224648677	30.390039	353.4809609	193.8682608	272.4302692
303	55532 (2001 WG2)	55200	1.79468037	0.695968161	38.4704841	132.2892389	81.5723104	80.1643232
304	65674 (1988 SM)	55200	1.66462233	0.344178079	10.948271	313.1651631	0.9595805	346.7162782
305	65679 (1989 UQ)	55200	0.91518673	0.264845117	1.2919018	15.0349679	178.285599	234.867224
306	65690 (1991 DG)	55200	1.42730701	0.362828386	11.1514295	63.2301479	180.2184344	331.5626331
307	65706 (1992 NA)	55200	2.3947034	0.557922192	9.7164282	8.0807546	349.3987149	243.4735666
308	65717 (1993 BX3)	55200	1.39450424	0.28072815	2.7900984	289.9597192	175.5880847	114.0807451
309	65733 (1993 PC)	55200	1.15408362	0.474460906	4.15626	168.1988783	337.497958	261.1121329
310	65803 Didymos	55200	1.64451833	0.383826294	3.407769	319.1898848	73.247813	335.5803016
311	65909 (1998 FH12)	55200	1.09139994	0.539732536	3.5585037	284.3991868	108.6715293	207.5700959
312	65996 (1998 MX5)	55200	2.91758879	0.611919652	9.7013976	55.6841317	266.5713981	103.4396549
313	66008 (1998 QH2)	55200	1.42613125	0.362469362	61.0160981	13.8918804	168.9537853	25.4462935
314	66063 (1998 RO1)	55200	0.99083508	0.720256404	22.6767314	151.106485	351.8929765	71.2050068
315	66146 (1998 TU3)	55200	0.78729444	0.483867629	5.4100966	84.5743491	102.3106327	170.9005351
316	66251 (1999 GJ2)	55200	1.53545883	0.197998298	11.2763936	142.3770577	196.261686	108.2089973
317	66253 (1999 GT3)	55200	1.33402159	0.837648094	19.5147873	260.8087416	157.6687389	29.0500343
318	66272 (1999 JW6)	55200	1.50755644	0.14324325	51.3105904	68.5018331	66.4158062	347.8412246
319	66391 (1999 KW4)	55200	0.64232546	0.688380381	38.884436	192.6087828	244.9263911	37.8173689
320	66400 (1999 LT7)	55200	0.85515854	0.572436379	9.064512	341.2877793	79.9123873	359.3130331
321	66407 (1999 LQ28)	55200	1.19844303	0.120121898	21.7703741	320.5064924	95.0374237	230.9364454

#	Object	Epoch	a	e	i	w	Node	M
322	66959 (1999 XO35)	55200	2.53531114	0.569185523	20.5580417	293.0011481	82.3035128	195.5694707
323	67367 (2000 LY27)	55200	1.30862587	0.212671277	9.0224673	184.7556915	264.5742556	293.3010269
324	67381 (2000 OL8)	55200	1.32039333	0.54293772	10.666458	266.6458811	295.0798319	130.4987981
325	67399 (2000 PJ6)	55200	1.30110325	0.346224652	14.6988698	225.1734497	332.945293	220.3232314
326	68031 (2000 YK29)	55200	1.37656637	0.128521671	15.1738691	31.7676607	123.7002969	160.1329121
327	68063 (2000 YJ66)	55200	2.33319602	0.457191047	5.7539566	49.5137609	309.3075605	255.8030098
328	68216 (2001 CV26)	55200	1.3192531	0.326260551	17.9982929	48.6714078	18.2191912	30.4897679
329	68267 (2001 EA16)	55200	1.50955519	0.427631569	38.8196722	317.3667091	8.0591516	173.8560964
330	68278 (2001 FC7)	55200	1.435778	0.114480814	2.6206092	234.3941539	99.1459598	254.5986208
331	68346 (2001 KZ66)	55200	1.50756882	0.416674353	16.6867618	140.1557967	219.4578254	138.2457529
332	68347 (2001 KB67)	55200	0.96271558	0.379813056	17.1380938	243.8406265	245.9618704	115.9249636
333	68348 (2001 LO7)	55200	2.15183558	0.842293615	25.4578736	181.5347589	236.2765158	168.5236035
334	68350 (2001 MK3)	55200	1.66952313	0.247717706	29.5679468	328.4256711	128.9095651	181.8015043
335	68359 (2001 OZ13)	55200	1.51749963	0.174471361	9.8551336	29.1051322	99.2944826	5.5418108
336	68372 (2001 PM9)	55200	1.61836535	0.41570659	8.0939694	322.1022568	253.11432	92.4676582
337	68548 (2001 XR31)	55200	1.70648753	0.436596962	22.7313366	24.609623	302.1182931	319.5399553
338	68950 (2002 QF15)	55200	1.05672667	0.344245168	25.1534352	255.5001955	236.2770847	195.8030392
339	69230 Hermes	55200	1.65553677	0.623981155	6.0682601	92.7034558	34.2785883	299.7916848
340	85182 (1991 AQ)	55200	2.21363523	0.780085054	3.1895243	241.1165926	341.4068548	251.4143092
341	85184 (1991 JG1)	55200	1.37409423	0.184785347	33.8751687	322.6821496	226.4319218	236.1193786
342	85236 (1993 KH)	55200	1.23423605	0.311327044	12.8030359	293.7502085	54.4505638	329.8910208
343	85275 (1994 LY)	55200	1.88983542	0.442204589	17.7298624	202.7222377	141.2440813	320.1954907
344	85490 (1997 SE5)	55200	3.72495042	0.668057412	2.5997327	56.9176434	287.5844678	254.1356957
345	85585 Mjolnir	55200	1.29745556	0.356192629	4.0839788	95.3377486	2.3910559	36.4461231
346	85628 (1998 KV2)	55200	1.59329403	0.331951012	13.0285633	50.4832264	66.8321566	14.6729783
347	85640 (1998 OX4)	55200	1.58096565	0.485931216	4.5136616	117.0315115	299.7645553	216.6518922
348	85709 (1998 SG36)	55200	1.64591673	0.337432389	24.8466794	29.6011954	186.6429396	261.8373404
349	85713 (1998 SS49)	55200	1.92308391	0.640239387	10.7627088	102.3661233	41.5898906	45.5843575
350	85770 (1998 UP1)	55200	0.99848703	0.34491242	33.1805068	234.3333496	18.3859952	179.9849782
351	85774 (1998 UT18)	55200	1.40378672	0.329132244	13.5885274	50.0166236	64.7088282	216.9198621
352	85804 (1998 WQ5)	55200	1.72085492	0.354606305	27.6594317	269.7065915	285.8302075	234.269606
353	85818 (1998 XM4)	55200	1.65677403	0.416982556	62.7001697	301.2881746	235.6838754	330.3338805
354	85839 (1998 YO4)	55200	1.6536701	0.247927181	9.324695	199.4186365	28.5925319	289.1247766
355	85867 (1999 BY9)	55200	1.83082574	0.301893945	0.9423396	287.0475704	254.6939497	114.6106187
356	85938 (1999 DJ4)	55200	1.85328906	0.483386614	9.1504173	197.5869327	19.973251	92.2247605
357	85953 (1999 FK21)	55200	0.73878108	0.703169509	12.6020006	172.333708	180.5370559	255.9666632
358	85989 (1999 JD6)	55200	0.88266558	0.632812795	17.0520937	309.1744409	130.2660878	43.2481419
359	85990 (1999 JV6)	55200	1.00773265	0.311224267	5.3138017	235.5306748	124.5964131	92.825776
360	86039 (1999 NC43)	55200	1.7595546	0.578931725	7.1215266	120.5093425	311.8622157	97.3646376
361	86067 (1999 RM28)	55200	1.81725052	0.323535669	30.54017	301.8144559	136.1304677	20.0822775
362	86324 (1999 WA2)	55200	1.96627468	0.434462359	34.6138216	75.2461754	293.7788501	290.9414967
363	86326 (1999 WK13)	55200	1.84419509	0.362913912	34.2967801	312.439699	78.5255269	25.2035584
364	86450 (2000 CK33)	55200	0.96812103	0.414883885	18.1065279	215.5635446	124.9081733	248.3882822
365	86666 (2000 FL10)	55200	1.46289386	0.426773866	29.0155804	258.8093229	187.0025718	233.5696953
366	86667 (2000 FO10)	55200	0.8592765	0.594725492	14.2842751	172.4076753	208.3889249	253.225644
367	86819 (2000 GK137)	55200	1.99551216	0.506340129	10.0553227	150.2000697	164.9920075	124.6969639
368	86829 (2000 GR146)	55200	1.46278744	0.57487555	14.3852274	31.290865	78.569827	225.0248092
369	86878 (2000 HD24)	55200	1.34149416	0.61846316	9.4733463	214.7858699	231.0954923	129.460336
370	87024 (2000 JS66)	55200	1.19641247	0.189737589	14.4330134	84.8843941	230.5918129	51.0386153
371	87025 (2000 JT66)	55200	1.22658759	0.483710312	25.3206455	359.5597313	120.5445539	88.6689458
372	87309 (2000 QP)	55200	0.84746278	0.463138275	34.7444561	188.1390686	294.3061302	247.1836435
373	87311 (2000 QJ1)	55200	1.58993212	0.512817553	7.688121	343.3193809	191.5051931	358.7570865
374	87684 (2000 SY2)	55200	0.85867208	0.642682065	19.2337121	47.7102519	162.0980347	333.8245165
375	88188 (2000 XH44)	55200	2.00692822	0.392981937	11.3915956	194.7824121	340.3293235	12.9369052
376	88213 (2001 AF2)	55200	0.95398065	0.595303337	17.8142683	194.9560546	114.3069258	2.1479891
377	88254 (2001 FM129)	55200	1.18189021	0.629443971	1.5239645	139.7069452	272.5850078	346.1196059
378	88263 (2001 KQ1)	55200	2.09673299	0.431647742	38.8197897	241.5118378	232.9410525	6.5051547
379	88264 (2001 KN20)	55200	2.14776875	0.453144478	12.0857937	201.3012239	105.0824331	247.9815302
380	88710 (2001 SL9)	55200	1.06134041	0.270111452	21.8990716	329.2753032	202.8872533	56.0123305
381	88959 (2001 TZ44)	55200	1.72364421	0.564200788	53.8050474	114.9656759	39.0351601	185.7095814
382	89136 (2001 US16)	55200	1.35572599	0.252744196	1.9043709	67.0027281	176.0199905	201.7271663
383	89355 (2001 VS78)	55200	1.78722213	0.307936723	22.6680816	84.8017388	103.2003805	96.7681528
384	89830 (2002 CE)	55200	2.07680254	0.507611858	43.7045635	5.6553808	19.9547486	275.8743659
385	89958 (2002 LY45)	55200	1.64173572	0.886257109	9.9666203	222.5098865	188.5468564	176.0391903
386	89959 (2002 NT7)	55200	1.73549597	0.528667886	42.3285456	300.6547905	132.1132763	38.3799808

#	Object	Epoch	a	e	i	w	Node	M
387	90075 (2002 VU94)	55200	2.1358514	0.573464654	8.9307022	30.2317474	226.9697418	222.3776955
388	90147 (2002 YK14)	55200	1.47416854	0.331584078	27.9902124	104.9689944	282.7726915	347.4330757
389	90367 (2003 LC5)	55200	1.15546946	0.426179444	16.8780728	313.7342536	86.8982504	7.640511
390	90373 (2003 SZ219)	55200	1.62686377	0.204381645	9.8723685	218.5748663	189.4698753	351.9013891
391	90403 (2003 YE45)	55200	1.23464914	0.28014337	19.0017777	306.7651017	286.3176753	60.8694577
392	90416 (2003 YK118)	55200	1.69380582	0.49238787	7.851719	232.8751767	327.0636684	225.1478432
393	96189 Pygmalion	55200	1.82023266	0.307655151	13.9879339	292.8396236	287.3732171	228.3983217
394	96315 (1997 AP10)	55200	1.44301883	0.643390609	6.6528507	356.1256539	293.1791107	20.269923
395	96536 (1998 SO10)	55200	2.29820848	0.777521029	41.4543905	22.3980368	199.5739757	128.826369
396	96590 (1998 XB)	55200	0.90800845	0.351198705	13.5969838	202.6762598	75.7964134	125.0598351
397	96631 (1999 FP59)	55200	1.69932597	0.259383084	1.772692	303.6472559	19.7425679	207.6463348
398	96744 (1999 OW3)	55200	2.08882159	0.779993014	35.2211099	35.329051	196.4861938	227.7456733
399	97725 (2000 GB147)	55200	1.79809557	0.309337397	18.2021179	212.1422756	311.8574541	0.4611874
400	98943 (2001 CC21)	55200	1.0324191	0.219211899	4.8085388	179.306736	75.5998178	91.0893881
401	99248 (2001 KY66)	55200	1.86654193	0.507493556	10.6289658	61.2131726	284.3820703	72.867033
402	99799 (2002 LJ3)	55200	1.46174919	0.275592683	7.56	249.659432	122.4966491	15.9873185
403	99907 (1989 VA)	55200	0.7284919	0.59467659	28.7949327	2.8203554	225.6163654	320.5479352
404	99935 (2002 AV4)	55200	1.65400956	0.645003361	12.7559522	322.8323814	16.4647401	9.5329446
405	99942 Apophis	55200	0.9224193	0.19121106	3.3315178	126.4244705	204.439304	339.9486157
406	100004 (1983 VA)	55200	2.59732579	0.698926563	16.2711595	12.0512171	77.3277884	63.748143
407	100085 (1992 UY4)	55200	2.63756377	0.625904305	2.8085378	38.2293537	308.4802097	4.8048389
408	100756 (1998 FM5)	55200	2.26737307	0.553584785	11.514523	311.5887989	176.9389913	175.1998522
409	100926 (1998 MQ)	55200	1.7831479	0.407978767	24.226022	138.6643608	221.1813815	254.0668243
410	101869 (1999 MM)	55200	1.62380814	0.61082179	4.7647353	268.5545044	111.1226519	1.6101825
411	101873 (1999 NC5)	55200	2.02929402	0.393364927	45.767912	295.2240962	128.8815028	138.5034554
412	101955 (1999 RQ36)	55200	1.12630145	0.20377864	6.0350326	66.2268185	2.0612862	163.2247754
413	102873 (1999 WK11)	55200	2.13358386	0.46554011	7.4646454	220.3166466	72.7020302	164.8671037
414	103067 (1999 XA143)	55200	1.84388977	0.581381678	38.532632	103.9181488	116.781205	323.0620835
415	105140 (2000 NL10)	55200	0.9142948	0.817095109	32.5172425	281.5390503	237.4629932	67.8371294
416	105141 (2000 NF11)	55200	1.4210398	0.18903455	14.8236891	115.8127196	123.784654	261.1797746
417	106538 (2000 WK63)	55200	2.43679265	0.758936273	10.4000963	40.8983142	164.0675985	103.2153672
418	106589 (2000 WN107)	55200	2.14932382	0.614807844	14.335624	11.6244772	163.4603293	264.1828701
419	108519 (2001 LF)	55200	1.60339967	0.270903898	16.3913047	343.7313589	267.3368175	94.3887594
420	108906 (2001 PL9)	55200	1.23538731	0.36052697	20.9245819	343.9404371	172.1058456	186.9920091
421	111253 (2001 XU10)	55200	1.7536543	0.439415676	42.0280649	6.8707659	310.1993095	290.403618
422	112221 (2002 KH4)	55200	2.26937293	0.444775693	58.7247424	356.3080651	230.1139384	103.6946152
423	112985 (2002 RS28)	55200	2.2199727	0.492745745	46.9836654	105.3595601	212.0654938	102.7204287
424	115052 (2003 RD6)	55200	1.66872294	0.318159726	31.3227322	88.1868323	190.5929126	29.4877242
425	136564 (1977 VA)	55200	1.86518566	0.394337837	2.9806864	172.4620479	224.5852516	227.5277777
426	136582 (1992 BA)	55200	1.34183644	0.067875287	10.4977958	107.2994429	140.2421192	79.1392411
427	136617 (1994 CC)	55200	1.63750047	0.417029823	4.683322	24.733962	268.6333213	84.4580574
428	136618 (1994 CN2)	55200	1.57323904	0.395024689	1.4382255	248.1958487	99.3682504	162.6638988
429	136635 (1994 VA1)	55200	1.57337282	0.174735596	7.6348774	310.8737547	231.8049302	113.2221005
430	136745 (1995 WL8)	55200	2.3657922	0.483782166	17.7728003	131.4935082	248.0872568	330.1285227
431	136770 (1996 PC1)	55200	1.83966079	0.451499716	25.1178846	45.7665565	326.3375555	112.9477882
432	136773 (1996 TR6)	55200	1.58482926	0.180277871	22.0984422	117.6182673	196.3478585	286.6455399
433	136793 (1997 AQ18)	55200	1.14696334	0.465341844	17.379411	36.9644708	296.3184685	299.9723545
434	136795 (1997 BQ)	55200	1.74524917	0.478984042	11.0061155	147.3596772	50.2389072	193.9738002
435	136818 Selqet	55200	0.93757032	0.34643397	12.771206	203.7486739	260.032379	92.6426984
436	136839 (1997 WT22)	55200	1.48587476	0.305965033	8.1588849	74.6882781	72.0038859	194.6038905
437	136849 (1998 CS1)	55200	1.49122282	0.578419398	7.7879824	97.4702362	110.9300554	162.7556793
438	136874 (1998 FH74)	55200	2.20063185	0.884748164	21.2553582	193.2766739	197.6130414	265.3311813
439	136897 (1998 HJ41)	55200	1.36338541	0.124883901	38.8759215	120.0938751	211.8937801	31.3646838
440	136900 (1998 HL49)	55200	1.74263457	0.635500141	11.0170919	238.9852372	206.2549511	101.157235
441	136923 (1998 HJ2)	55200	2.13451284	0.442268439	6.6186072	286.9514733	51.3085477	177.3737327
442	136993 (1998 ST49)	55200	2.31036667	0.592447632	24.5319101	47.8770757	18.3837741	64.5734029
443	137032 (1998 UO1)	55200	1.59503858	0.763009275	25.5334866	252.2603749	358.6882938	249.2738447
444	137044 (1998 UC50)	55200	2.26750898	0.430425151	4.3897137	166.1341447	335.1831502	45.8578331
445	137052 (1998 VO33)	55200	1.24795086	0.809452257	14.9357579	209.8104195	64.3792767	35.6495137
446	137062 (1998 WM)	55200	1.22468511	0.315356899	22.5139491	172.4788896	45.6819484	303.3314957
447	137064 (1998 WP5)	55200	1.37419151	0.195223742	19.5028705	97.5716442	36.1674134	274.7170013
448	137078 (1998 XZ4)	55200	1.93770815	0.638936378	23.2123785	9.4743591	324.5338035	70.9818589
449	137084 (1998 XS16)	55200	1.21231586	0.496531881	26.5515266	358.2428051	273.0344237	291.0994676
450	137099 (1998 YW3)	55200	1.1000934	0.462671454	28.7950462	194.8038026	94.3107949	356.283876

#	Object	Epoch	a	e	i	w	Node	M
451	137108 (1999 AN10)	55200	1.45882703	0.56198781	39.9338863	268.2906793	314.4679	35.9077942
452	137120 (1999 BJ8)	55200	1.90021067	0.548566087	9.0162805	221.4814476	339.8235006	40.2922717
453	137125 (1999 CT3)	55200	1.42684168	0.131756921	34.2374989	268.2378502	321.9670729	57.7894392
454	137126 (1999 CF9)	55200	1.77242999	0.599373593	5.5459063	89.8840443	157.3539004	186.551837
455	137158 (1999 FB)	55200	1.17986654	0.606886051	12.8998649	2.9701475	37.1496508	221.2494044
456	137170 (1999 HF1)	55200	0.81902873	0.462412006	25.6627503	253.352202	155.9154077	269.9324012
457	137175 (1999 JA11)	55200	1.26138785	0.341118797	16.4312809	328.2608393	116.3013716	298.3337106
458	137199 (1999 KX4)	55200	1.45734194	0.292690588	16.5721288	76.2722057	105.0083522	66.4560063
459	137427 (1999 TF211)	55200	2.45112632	0.612765479	39.1900434	161.428247	348.2332669	184.4925277
460	137671 (1999 XP35)	55200	1.43469686	0.184095236	21.1021457	198.1948905	263.5072641	301.9822238
461	137799 (1999 YB)	55200	1.32123493	0.074978314	6.790626	192.6841788	31.0363762	95.5989404
462	137802 (1999 YT)	55200	1.77656125	0.351868945	31.5825904	272.5710944	116.505901	126.1304053
463	137805 (1999 YK5)	55200	0.82942738	0.558294588	16.7414176	292.7717453	349.6358609	243.677056
464	137911 (2000 AB246)	55200	2.30499729	0.492583788	3.7466457	311.6637105	29.7466536	325.134768
465	137924 (2000 BD19)	55200	0.87647379	0.895046768	25.6904758	324.2712495	333.7817161	206.4255961
466	137925 (2000 BJ19)	55200	1.29176725	0.763835236	31.1043021	175.4658491	131.2613249	121.5402882
467	138013 (2000 CN101)	55200	1.59858396	0.634929983	15.9524662	118.5031992	183.547805	191.5387734
468	138095 (2000 DK79)	55200	1.77641373	0.414161211	60.6803139	2.4588315	43.4801366	132.508654
469	138127 (2000 EE14)	55200	0.66184523	0.532991172	26.4686187	197.8102968	155.7915924	271.2882374
470	138155 (2000 ES70)	55200	1.80855168	0.319537849	25.4474491	281.5111891	177.8050572	54.2080974
471	138175 (2000 EE104)	55200	1.00476794	0.293429992	5.2417863	280.9055736	25.9342286	165.2483753
472	138205 (2000 EZ18)	55200	2.57228496	0.618884394	11.0485083	304.066229	5.2097461	90.7750757
473	138258 (2000 GD2)	55200	0.75778739	0.476621407	32.1431379	16.9427198	358.1481586	71.4643782
474	138325 (2000 GO82)	55200	2.16398387	0.8041248	25.5950627	164.2849819	173.4609007	349.1743602
475	138359 (2000 GX127)	55200	1.14133222	0.361258452	20.2395149	4.675206	44.0331857	141.0173375
476	138404 (2000 HA24)	55200	1.13974976	0.318838006	2.1723526	141.756728	309.8180975	84.0770282
477	138524 (2000 OJ8)	55200	2.36136434	0.565667182	6.2165784	181.0784779	226.7036593	178.9162134
478	138727 (2000 SU180)	55200	2.10342395	0.606896372	11.8824436	135.9349013	328.1653498	345.5821599
479	138815 (2000 TQ64)	55200	2.08780595	0.382750923	8.2626134	227.7084952	20.511352	120.677266
480	138846 (2000 VJ61)	55200	2.18313679	0.563924337	18.6720038	280.4206391	270.6871845	270.5327875
481	138847 (2000 VE62)	55200	1.61894376	0.287410055	22.1779757	16.1377905	207.1646247	341.7955406
482	138852 (2000 WN10)	55200	1.00143352	0.299174968	21.4781827	225.1352672	60.9831212	146.1548403
483	138859 (2000 WN63)	55200	1.57365904	0.531850551	13.1435925	144.2640478	55.997107	128.7868636
484	138877 (2000 XG47)	55200	2.14102843	0.542384435	25.2787957	127.4883727	44.0075068	290.0392069
485	138883 (2000 YL29)	55200	1.53603145	0.344141125	21.8883262	115.7985219	182.8341504	89.1818121
486	138893 (2000 YH66)	55200	1.17295295	0.743542564	18.327791	341.2812526	265.3273375	317.1212065
487	138911 (2001 AE2)	55200	1.34961658	0.081636635	1.660923	43.0939194	171.4934	165.0512482
488	138925 (2001 AU43)	55200	1.89668085	0.377267047	72.1415343	149.2674275	129.3240714	48.4552328
489	138937 (2001 BK16)	55200	2.07242196	0.678310388	31.8416749	252.2507138	99.0977686	23.4682336
490	138947 (2001 BA40)	55200	1.11898565	0.25376816	12.8448459	359.9932922	270.9464784	81.1394898
491	138971 (2001 CB21)	55200	1.03476076	0.333602023	7.9034722	271.6882147	353.8503723	96.8155791
492	139047 (2001 EB16)	55200	1.86224023	0.386299186	47.0073707	346.1389237	149.583912	177.1842885
493	139056 (2001 FY)	55200	1.8859882	0.327813955	4.7314655	110.3506953	111.3138692	124.7440953
494	139211 (2001 GN2)	55200	1.86041522	0.45175284	26.0647375	3.3213903	173.5981282	167.9148689
495	139289 (2001 KR1)	55200	1.25960789	0.841300003	23.2206163	291.2208926	102.9865534	343.2214583
496	139345 (2001 KA67)	55200	1.80564749	0.701983744	22.3846565	37.6034944	108.6770792	128.0496504
497	139359 (2001 ME1)	55200	2.65013839	0.865910718	5.7887845	300.0567939	86.7372181	340.6195471
498	139622 (2001 QQ142)	55200	1.42284817	0.311112735	9.3149207	337.8125748	83.3100004	294.3484485
499	140039 (2001 SO73)	55200	1.81957282	0.568710591	4.8614426	30.6004681	197.346366	216.4085853
500	140158 (2001 SX169)	55200	1.34698054	0.461141008	2.5133153	42.5733128	126.9387049	290.8101456
501	140288 (2001 SN289)	55200	1.78380137	0.506958489	53.2603886	225.5632374	357.1547358	271.0053314
502	140333 (2001 TD2)	55200	0.96196469	0.481451781	19.0369527	199.0182889	12.8878864	14.8750403
503	140928 (2001 VG75)	55200	1.51864712	0.297056971	20.6627857	257.2296495	245.5388528	45.2711127
504	141018 (2001 VE47)	55200	1.39848818	0.241301172	2.8667533	100.9944709	91.8442335	229.397678
505	141052 (2001 XR1)	55200	1.24555427	0.550141682	17.6509063	304.0432362	291.6138123	193.9231832
506	141053 (2001 XT1)	55200	1.52780875	0.579388628	2.7427588	31.0978309	316.4873877	130.4499746
507	141056 (2001 XV4)	55200	1.81711019	0.444199341	28.8380087	300.3630732	259.3202784	21.6115343
508	141078 (2001 XQ30)	55200	1.86293864	0.451176588	11.4687229	270.5197838	234.8786677	20.2702248
509	141079 (2001 XS30)	55200	1.16462275	0.828128285	28.5244636	0.8394375	251.4806002	30.8406574
510	141354 (2002 AJ29)	55200	1.98874091	0.452026995	10.9260171	0.283188	204.0418278	277.5076489
511	141424 (2002 CD)	55200	0.97951441	0.176544459	6.8777407	331.7116106	8.7211608	190.7595273
512	141432 (2002 CQ11)	55200	0.97886279	0.428438279	2.4597252	272.7322171	81.4273024	138.691911
513	141447 (2002 CW59)	55200	2.37962315	0.507041779	32.1395055	7.2069942	151.1948171	37.9985019
514	141484 (2002 DB4)	55200	0.85758892	0.369445991	16.6028644	94.0813517	234.3221011	61.2442336
515	141495 (2002 EZ11)	55200	1.11406696	0.802223465	2.3495884	317.4956534	52.1345601	349.3448793

#	Object	Epoch	a	e	i	w	Node	M
516	141498 (2002 EZ16)	55200	0.92160122	0.566439703	30.1438484	25.3254107	262.9377311	73.8635735
517	141525 (2002 FV5)	55200	1.086896	0.724862351	34.0130622	308.0467405	38.9227155	234.2036917
518	141526 (2002 FA6)	55200	1.01371097	0.322402365	30.0996657	173.3490403	174.7140708	87.8490346
519	141527 (2002 FG7)	55200	1.5138672	0.626691286	9.197325	247.444565	187.6926771	104.8316081
520	141531 (2002 GB)	55200	0.99219885	0.528886002	22.5531467	8.3099368	40.8464812	15.8355713
521	141593 (2002 HK12)	55200	2.00181189	0.529995758	2.3596816	2.0501597	307.1782076	222.0788797
522	141614 (2002 JV15)	55200	1.62378772	0.536362556	7.173829	127.1839785	200.7829629	216.3719375
523	141670 (2002 JS100)	55200	2.38422189	0.485163435	13.3369352	191.5246695	144.329572	341.7514677
524	141761 (2002 MC)	55200	2.57810132	0.508445409	18.9027219	159.9742328	151.608164	289.2353237
525	141765 (2002 MP3)	55200	1.99983766	0.469001442	33.0683573	270.0824176	100.4509139	173.0304164
526	141851 (2002 PM6)	55200	1.19798028	0.850234221	19.2127463	224.2660151	304.2688206	272.0745131
527	141874 (2002 PQ34)	55200	1.83483342	0.348482486	10.9844713	290.8310258	143.7499594	273.5685679
528	142040 (2002 QE15)	55200	1.66714169	0.344568297	28.2408063	160.4105968	226.4397595	121.5760579
529	142348 (2002 RX211)	55200	2.06532152	0.458203894	6.0623014	324.0962446	96.742995	136.9459709
530	142464 (2002 TC9)	55200	1.23340295	0.154454311	16.2787433	29.201851	191.88675	260.0273017
531	142555 (2002 TB58)	55200	2.62978279	0.566248901	23.354762	267.6835453	219.6272942	231.6139452
532	142561 (2002 TX68)	55200	1.67396512	0.293274732	16.6516131	122.3242623	150.2364238	201.0018465
533	142563 (2002 TR69)	55200	1.66014774	0.34399235	20.5014736	192.0741083	342.0454662	355.98837
534	142781 (2002 UM11)	55200	1.95074513	0.387263604	41.034475	228.9975952	229.0626393	187.1817363
535	143381 (2003 BC21)	55200	2.59900878	0.507376494	5.4642463	113.464834	292.7005329	281.6217915
536	143404 (2003 BD44)	55200	1.96657517	0.605050025	2.6659818	88.5607265	181.8558132	114.3771696
537	143409 (2003 BQ46)	55200	1.94928746	0.351665379	8.1688194	44.1084644	163.905987	254.2534101
538	143487 (2003 CR20)	55200	2.12167225	0.731808336	4.9913996	88.1669832	177.703608	50.7698162
539	143527 (2003 EN16)	55200	1.66134824	0.352037067	17.3121707	242.0744367	181.8016684	143.9212434
540	143624 (2003 HM16)	55200	1.96594531	0.576505431	35.6620239	46.8803765	196.0947612	133.3168866
541	143637 (2003 LP6)	55200	1.74608626	0.88357371	43.6102354	260.4531677	144.8467692	281.0979461
542	143643 (2003 NP7)	55200	2.18154674	0.416230415	11.1052575	323.4881772	285.379306	15.0732338
543	143649 (2003 QQ47)	55200	1.08528177	0.18704446	62.1031491	104.9924893	1.0064401	147.0460364
544	143651 (2003 QO104)	55200	2.13525392	0.524621311	11.611154	183.5630661	58.2778403	69.3254555
545	143678 (2003 SA224)	55200	1.64926388	0.329049255	13.864288	141.91098	2.8565611	304.4131218
546	143947 (2003 YQ117)	55200	2.18059402	0.655273455	21.0073659	135.5992808	217.6418787	13.5477827
547	143992 (2004 AF)	55200	1.9716063	0.553199136	27.1685406	57.7802559	315.8008631	82.3008992
548	144332 (2004 DV24)	55200	1.42257825	0.289615171	55.8993982	186.325303	171.1598308	310.2306491
549	144411 (2004 EW9)	55200	1.9177799	0.532779137	8.7821308	8.0149015	288.9393024	15.93168
550	144861 (2004 LA12)	55200	2.51218769	0.747887569	39.405671	199.4167762	159.2493823	88.4824986
551	144898 (2004 VD17)	55200	1.50800055	0.588828841	4.2231337	90.74592	224.2023064	312.0181221
552	144900 (2004 VG64)	55200	0.96819325	0.655362108	36.2722835	43.8858718	208.9091981	203.7872163
553	144901 (2004 WG1)	55200	1.64026666	0.521430778	13.0552054	232.2738627	42.1416882	257.0753866
554	144922 (2005 CK38)	55200	2.13189613	0.412845883	8.2435091	213.5725025	8.8964793	177.0941575
555	145656 (4788 P-L)	55200	2.63007748	0.560813633	11.0291231	97.9901125	176.7919554	210.488404
556	152558 (1990 SA)	55200	2.01371262	0.442188851	38.1252632	115.1315166	172.2535917	297.2814583
557	152560 (1991 BN)	55200	1.4436344	0.398139044	3.4460181	80.7304004	268.9929349	67.8762119
558	152561 (1991 RB)	55200	1.45447044	0.485513799	19.5869556	68.8417049	359.4127194	125.6874428
559	152563 (1992 BF)	55200	0.9080301	0.271804045	7.2540027	336.4419447	315.4656445	113.1852769
560	152564 (1992 HF)	55200	1.39097644	0.561914935	13.3126297	128.1936102	213.4939294	223.9245417
561	152575 (1994 GY)	55200	2.68539857	0.524172684	12.328646	190.5443356	33.8030616	204.0187355
562	152637 (1997 NC1)	55200	0.86551167	0.208250152	16.7178007	16.6541169	96.5649561	342.9954148
563	152664 (1998 FW4)	55200	2.51557084	0.721525984	3.471552	80.8404646	357.9054784	13.1619105
564	152667 (1998 FR11)	55200	2.79127705	0.713073065	6.6314116	157.9602321	130.3089743	156.7337649
565	152671 (1998 HL3)	55200	1.12850617	0.366004776	2.6786731	188.0825263	163.7467819	168.2521678
566	152679 (1998 KU2)	55200	2.25304439	0.552486356	4.9215279	120.1877125	205.9237047	126.9521284
567	152680 (1998 KJ9)	55200	1.44804031	0.639824372	10.9332489	259.8945214	98.7326177	201.6655603
568	152685 (1998 MZ)	55200	1.346979	0.573172463	0.1449948	41.3123903	120.1548657	183.7108868
569	152742 (1998 XE12)	55200	0.87827425	0.739074132	13.4343867	353.0725339	280.0959632	270.5489392
570	152754 (1999 GS6)	55200	1.19108465	0.497347892	2.0220906	134.7936136	314.6466089	148.8142326
571	152756 (1999 JV3)	55200	1.45098226	0.41507813	15.2252255	101.4317319	229.1449767	342.8487075
572	152770 (1999 RR28)	55200	1.87902382	0.653318023	7.1336548	284.2854	178.4538875	324.6900576
573	152787 (1999 TB10)	55200	1.36301506	0.231621634	15.954087	137.309974	1.9601626	47.7972523
574	152828 (1999 VT25)	55200	1.16159752	0.523245469	5.1467019	319.0251547	222.0956728	324.53242
575	152889 (2000 CF59)	55200	1.6794734	0.640379709	41.5994019	222.3702155	141.8550633	247.4103925
576	152895 (2000 QO101)	55200	2.28881003	0.494125381	2.9828847	173.8435345	29.913208	281.734744
577	152931 (2000 EA107)	55200	0.92966014	0.455807373	28.5768861	278.0004665	52.9404571	160.6478775
578	152941 (2000 FM10)	55200	1.48104021	0.680895265	8.734996	343.8442236	18.6121646	9.3808097
579	152942 (2000 FN10)	55200	1.93845142	0.455681754	27.1206872	235.1937628	8.3393761	204.5011567
580	152952 (2000 GC2)	55200	1.3835695	0.187041473	55.2977539	280.2868136	358.7159327	274.1403343

#	Object	Epoch	a	e	i	w	Node	M
581	152964 (2000 GP82)	55200	1.39657049	0.393242955	13.2249068	332.9757984	114.9314709	37.0884569
582	152978 (2000 GJ147)	55200	1.16208088	0.23659834	25.0077334	240.8216996	57.9177644	205.7377081
583	153002 (2000 IG5)	55200	1.34056096	0.795594707	31.4733729	233.3203813	213.1954452	118.6831303
584	153195 (2000 WB1)	55200	1.30120418	0.619009174	41.1152244	262.8780145	21.4767635	113.9439183
585	153201 (2000 WO107)	55200	0.91134376	0.780631703	7.7785824	213.616016	69.3494932	222.0347059
586	153219 (2000 YM29)	55200	2.08916507	0.43493476	40.3183906	0.7250327	116.6066396	351.3614655
587	153220 (2000 YN29)	55200	2.53346052	0.672373892	5.443751	132.4272327	72.7397738	50.6064614
588	153243 (2001 AU47)	55200	1.29893372	0.530639628	35.9848473	9.318825	311.9417115	94.8362091
589	153249 (2001 BW15)	55200	2.11828615	0.590588578	41.2149624	297.9306452	329.0164542	247.8090365
590	153267 (2001 CB32)	55200	1.78157915	0.614271733	9.6605292	330.3248632	75.6736406	289.9791593
591	153271 (2001 CL42)	55200	1.55688767	0.4024361	21.6560703	270.7398716	12.1432763	120.1117364
592	153306 (2001 JL1)	55200	2.55168859	0.523455713	26.9837279	272.526387	226.7281229	72.1802868
593	153311 (2001 MG1)	55200	2.50464332	0.643356138	28.4267153	218.3784502	142.4763917	39.8260371
594	153315 (2001 NH6)	55200	1.23747931	0.449738397	34.6948536	288.3404492	112.6056583	341.975992
595	153349 (2001 PJ9)	55200	1.79826587	0.639972886	10.5197488	290.7334744	284.2148429	212.4143397
596	153415 (2001 QP153)	55200	0.89159431	0.213718026	50.2084584	244.3052283	317.7020703	87.6117637
597	153460 (2001 RN)	55200	1.41370567	0.580859378	10.0947149	30.2646524	211.5604461	21.2205289
598	153591 (2001 SN263)	55200	1.98805614	0.478023075	6.6863333	172.7685938	325.872552	243.2129074
599	153792 (2001 VH75)	55200	2.10334491	0.740997221	10.632821	243.5589228	276.8578673	205.8816389
600	153814 (2001 WN5)	55200	1.71118682	0.466958886	1.9217413	44.2870167	277.726446	254.1284482
601	153842 (2001 XT30)	55200	2.73861388	0.572777138	9.0712496	218.7420633	140.3983842	309.1911684
602	153951 (2002 AC3)	55200	1.83589416	0.34256213	15.4891405	214.8021042	314.5653826	41.6489808
603	153953 (2002 AD9)	55200	1.77333417	0.808870504	31.1018912	9.65603	2.6430963	169.2041626
604	153957 (2002 AB29)	55200	2.53348164	0.758362824	46.5437611	73.2141575	89.7879805	340.3253984
605	153958 (2002 AM31)	55200	1.70467025	0.452166114	4.6218341	197.6782348	144.5724245	293.1325642
606	154007 (2002 BY)	55200	1.81865234	0.3464831	2.7226737	23.5887182	214.3679511	18.4831522
607	154019 (2002 CZ9)	55200	1.32566959	0.360171214	4.9706499	80.6609688	142.9588736	17.5104563
608	154020 (2002 CA10)	55200	1.54180678	0.589835662	12.1315667	222.0297855	145.4552778	105.869261
609	154029 (2002 CY46)	55200	1.89055219	0.463047358	44.1671306	319.3419567	346.2295455	282.8080052
610	154035 (2002 CV59)	55200	1.21012186	0.532294922	49.0541494	347.0864369	13.1172411	186.026622
611	154144 (2002 FA5)	55200	1.83375763	0.29623661	23.6137164	126.2853353	172.6632913	331.365491
612	154229 (2002 JN97)	55200	1.851527	0.718552655	10.0712756	341.4273282	67.7456277	46.9139404
613	154244 (2002 KL6)	55200	2.30674269	0.548664032	3.2368743	96.023898	214.8708931	46.4069785
614	154268 (2002 RM129)	55200	1.51142839	0.464915577	14.5718127	357.4589254	132.7246257	236.7870563
615	154269 (2002 SM)	55200	1.87179765	0.485316802	14.4337722	217.1570141	10.9795155	21.9396674
616	154275 (2002 SR41)	55200	1.08262354	0.490747299	11.5922793	258.0445052	247.9223008	78.3538443
617	154276 (2002 SY50)	55200	1.70528694	0.690042235	8.7474935	99.3591093	34.3762437	57.0725536
618	154278 (2002 TB9)	55200	1.80423161	0.591783922	29.710161	322.541448	196.3620032	270.26636
619	154300 (2002 UO)	55200	1.20910571	0.472267264	8.3004409	184.1108994	90.7937965	209.8238217
620	154302 (2002 UQ3)	55200	1.71912982	0.562134859	28.8121504	280.8556642	222.8930837	29.9413562
621	154330 (2002 VX94)	55200	1.47609103	0.408882108	7.1665142	214.9495426	320.2716114	267.112629
622	154347 (2002 XK4)	55200	1.84956839	0.692124605	17.8153068	24.7276371	331.8122173	319.4750958
623	154453 (2003 CJ11)	55200	2.58905139	0.832875549	20.7070232	356.2564978	61.7496135	255.7269831
624	154555 (2003 HA)	55200	1.18437739	0.580472662	36.8227346	277.1097042	53.5668775	338.9721431
625	154589 (2003 MX2)	55200	2.29010429	0.45728961	7.1707601	300.0147978	59.0217724	274.5307803
626	154590 (2003 MA3)	55200	1.10584186	0.402291238	1.4112809	228.7375685	152.7790016	156.9547651
627	154631 (2003 WO25)	55200	1.55707572	0.492051788	15.9111522	175.9109461	357.9028373	343.2597828
628	154652 (2004 EP20)	55200	1.05852637	0.45062521	16.1754492	191.2865677	159.6347511	334.1685516
629	154656 (2004 FE3)	55200	2.31112218	0.647016104	22.9393806	338.2244924	339.176396	182.7314484
630	154658 (2004 FA18)	55200	1.09658661	0.454826383	19.2866316	318.5672593	29.6543446	246.2646341
631	154715 (2004 LB6)	55200	1.61816707	0.490666918	4.0971302	190.4888169	182.8291293	214.2706616
632	154807 (2004 PP97)	55200	1.48402229	0.316469297	15.5326206	68.539187	15.1890871	259.5624201
633	154988 (2004 XN35)	55200	1.50587826	0.680059294	9.8179838	189.9000096	133.02631	297.5007406
634	154991 Vinciguerra	55200	1.70501397	0.322860037	5.6371462	269.2181591	245.6957243	106.4579501
635	154993 (2005 EA94)	55200	1.51640391	0.663672731	10.3157866	308.8034561	104.2537209	234.7854782
636	155110 (2005 TB)	55200	1.26140404	0.348277005	30.3859459	44.7334229	226.2262702	43.6270892
637	155140 (2005 UD)	55200	1.27490937	0.87207544	28.7299987	207.5024731	19.813063	8.866201
638	155334 (2006 DZ169)	55200	2.03408092	0.408726991	6.6177692	275.4494921	15.1214313	45.6075622
639	155336 (2006 GA1)	55200	2.11707764	0.738597	4.2059536	355.2500634	64.3931353	119.8721561
640	155338 (2006 MZ1)	55200	1.56906414	0.482650836	2.0784893	138.4551833	226.7616334	253.6343716
641	155340 (2006 SK198)	55200	2.10507307	0.468441377	9.2491067	352.3234748	260.6355465	123.5237627
642	155341 (2006 SA218)	55200	1.47766683	0.241550155	18.5208228	277.9222848	144.4389593	271.8959828
643	159368 (1979 QB)	55200	2.33132639	0.442736556	3.3546437	12.1857077	342.4109741	180.3597588
644	159399 (1998 UL1)	55200	1.52688096	0.214040577	41.967855	353.1284849	214.8903807	148.433186

#	Object	Epoch	a	e	i	w	Node	M
645	159402 (1999 AP10)	55200	2.37663315	0.574725136	7.6287314	46.8570681	357.4571761	16.2103693
646	159454 (2000 DJ8)	55200	1.41132933	0.252689489	37.7504467	262.9029897	139.5860811	53.4045127
647	159459 (2000 KB)	55200	2.34032657	0.79668785	56.0589245	185.060794	185.4549924	229.9763836
648	159467 (2000 QK25)	55200	1.80914905	0.282832858	6.1371167	240.2602351	138.878796	277.3271672
649	159495 (2000 UV16)	55200	2.34766394	0.484983849	4.0810472	352.5994267	341.7886339	226.2104973
650	159504 (2000 WO67)	55200	2.43319035	0.618383384	9.7003517	237.649568	107.792945	176.3164852
651	159518 (2001 FF7)	55200	2.10467414	0.442863739	47.5309717	59.3499386	190.2207216	296.8584973
652	159533 (2001 HH31)	55200	1.65443058	0.289104455	12.8517778	275.8315677	71.7070954	294.5491206
653	159555 (2001 SJ276)	55200	1.63037831	0.230230255	29.4360634	123.4221215	215.0023168	8.5000824
654	159560 (2001 TO103)	55200	2.21387554	0.434673007	25.7205092	261.6520229	42.3433506	231.0463926
655	159608 (2002 AC2)	55200	1.6742255	0.351343514	58.8886331	208.0851746	102.7261249	49.6755118
656	159609 (2002 AQ3)	55200	2.11107398	0.462210841	40.0262738	243.4519245	124.3215035	271.8323247
657	159635 (2002 CZ46)	55200	1.70331721	0.324214559	16.2421155	246.2559694	173.4726974	256.5135178
658	159677 (2002 HQ11)	55200	1.850532	0.59576974	6.0461166	322.1099348	153.3714168	50.7374213
659	159686 (2002 LB6)	55200	1.80365699	0.688766737	24.6790919	140.8631953	244.8809913	7.217907
660	159699 (2002 PQ142)	55200	1.69591281	0.71672249	16.7872493	332.0878787	151.3672715	79.6664649
661	159856 (2004 JW6)	55200	2.15431098	0.466429911	9.754787	174.3644871	144.0080051	245.0891428
662	159857 (2004 L11)	55200	2.26506216	0.592739528	23.0334083	139.5817653	235.8608608	197.3109833
663	159923 (2004 YJ32)	55200	2.52363869	0.524952906	7.5254692	234.2485168	118.8430598	159.0683924
664	159928 (2005 CV69)	55200	1.65452274	0.419319234	27.749119	95.5663605	157.5806021	54.1071628
665	159929 (2005 UK)	55200	1.88680527	0.406785989	54.424198	19.401191	222.5909146	351.7849743
666	161989 Cacus	55200	1.12304218	0.213987907	26.0608342	102.1252851	161.2700851	186.6199729
667	161995 (1983 LB)	55200	2.28815985	0.478047126	25.2595338	220.7397782	81.2629277	229.7837351
668	161998 (1988 PA)	55200	2.14675272	0.406442957	8.2166466	137.4793925	162.2204409	295.4279291
669	161999 (1989 RC)	55200	2.31256594	0.515250156	7.3879843	181.1898052	140.2382735	286.1267903
670	162000 (1990 OS)	55200	1.6781218	0.462669871	1.0961065	21.3652123	346.6762825	312.0469742
671	162004 (1991 VE)	55200	0.89082022	0.664515215	7.2204176	193.5440209	61.9705608	302.986948
672	162011 (1994 AB1)	55200	2.82965504	0.598614076	4.5572172	343.0116827	66.7418869	133.7707973
673	162015 (1994 TF2)	55200	0.99305148	0.284142498	23.7538144	349.7103476	175.2627141	8.1310669
674	162038 (1996 DH)	55200	1.58706073	0.276641055	17.2321856	351.4453368	309.3492127	199.7519597
675	162039 (1996 JG)	55200	1.80235932	0.66038085	5.2799692	279.9822444	53.0738806	205.8791296
676	162058 (1997 AE12)	55200	2.36843552	0.552501252	4.8946624	59.5893037	305.7052048	260.4821912
677	162063 (1997 EH29)	55200	1.214263	0.666536668	13.0185688	198.5704	175.1728058	323.6445136
678	162080 (1998 DG16)	55200	0.89670808	0.358231583	16.2093427	356.8032319	344.4077187	175.647313
679	162082 (1998 HL1)	55200	1.24611325	0.187136542	20.0465863	148.4431587	213.5996664	2.8520406
680	162116 (1998 SA15)	55200	1.91639603	0.557488522	7.0981957	331.279765	114.3132946	61.0410698
681	162117 (1998 SD15)	55200	0.93251219	0.344835476	26.7978186	35.7978879	183.9670166	296.9371975
682	162120 (1998 SH36)	55200	1.08792775	0.57104434	2.1297566	278.6487066	218.0256794	269.1861033
683	162142 (1998 VR)	55200	0.87574697	0.318022092	21.8023304	170.6650519	46.4263937	58.5219105
684	162149 (1998 YQ11)	55200	1.87368282	0.396716501	11.9404384	245.4780719	256.7931498	98.5478428
685	162157 (1999 CV8)	55200	1.29699694	0.351608173	15.2640286	279.2308149	132.0488991	189.8838682
686	162161 (1999 DK3)	55200	2.11477358	0.443902141	43.1250383	103.0083979	149.8417354	152.3485949
687	162162 (1999 DB7)	55200	1.20589734	0.194868288	10.8411613	29.8099797	157.6430946	50.8831072
688	162168 (1999 GT6)	55200	2.80045681	0.588205658	4.0633778	78.8933367	206.2910293	69.354651
689	162173 (1999 JU3)	55200	1.18964141	0.190330872	5.8833075	211.4117136	251.636684	186.9695942
690	162181 (1999 LF6)	55200	1.40912506	0.280475001	18.9402124	140.7632267	208.5668255	60.8787935
691	162183 (1999 NB5)	55200	2.07517181	0.534567218	1.4219752	122.2950226	236.0320955	161.0270799
692	162186 (1999 OP3)	55200	2.71151425	0.609454602	27.5652189	271.2262407	311.5646349	160.1792259
693	162195 (1999 RK45)	55200	1.59799214	0.773213026	5.8934947	4.0942883	120.0400448	4.6791891
694	162196 (1999 RL45)	55200	1.82645061	0.374668381	22.4429484	234.1369135	172.0244321	31.2075184
695	162210 (1999 SM5)	55200	2.29477231	0.696282302	5.2098417	319.1175006	327.7884353	356.4589324
696	162214 (1999 TC10)	55200	2.32663445	0.583473147	19.260123	57.9944472	28.2730791	305.4656177
697	162215 (1999 TL12)	55200	1.08144185	0.436648434	17.3368146	346.708289	202.3771455	229.070036
698	162269 (1999 VO6)	55200	1.13541538	0.73826519	40.0890759	302.4539737	206.9402389	93.7588775
699	162273 (1999 VH12)	55200	1.59363457	0.236110308	20.1843702	40.8470848	234.4603359	138.427877
700	162361 (2000 AF6)	55200	0.87809829	0.411458163	2.6966596	200.0813376	110.8148315	195.0110986
701	162385 (2000 BM19)	55200	0.74092745	0.358579303	6.896012	247.5551381	70.4952874	336.9392185
702	162416 (2000 EH26)	55200	1.85420453	0.477311882	0.393643	18.9425655	215.3252279	295.9563635
703	162421 (2000 ET70)	55200	0.94691973	0.12353427	22.3227064	46.3466116	331.196841	13.0748582
704	162422 (2000 EV70)	55200	1.20770915	0.531146729	1.3931184	314.9592059	108.4554184	189.3005246
705	162433 (2000 FK10)	55200	1.3589143	0.481445794	13.9465738	246.9116989	41.7631683	7.1128416
706	162452 (2000 HO14)	55200	2.26436535	0.445183157	5.4553851	53.8178103	217.5149884	280.4705048
707	162463 (2000 JH5)	55200	1.14529718	0.237856149	22.2119093	353.3740405	80.2557709	90.9166923
708	162470 (2000 KX43)	55200	1.11265192	0.552821613	35.2784898	31.7504174	83.7894354	128.3706524
709	162472 (2000 LL)	55200	1.25879964	0.118326685	31.8559173	66.8479537	245.6866655	238.1249754

#	Object	Epoch	a	e	i	w	Node	M
710	162474 (2000 LB16)	55200	1.24080325	0.357616954	50.7082109	285.2717612	80.8917534	272.7550574
711	162483 (2000 PJ5)	55200	0.87265732	0.373607623	51.183404	7.6271973	124.4338973	333.649872
712	162510 (2000 QW69)	55200	1.37599066	0.301867117	38.1584404	220.6446788	344.384894	34.3789877
713	162566 (2000 RJ34)	55200	2.63636982	0.573663162	13.8493866	143.1826517	331.4013286	16.4278168
714	162567 (2000 RW37)	55200	1.24775244	0.250316309	13.7478102	133.2034632	333.3782123	153.0599375
715	162581 (2000 SA10)	55200	1.66741484	0.351582948	15.8933685	248.0941302	200.4164205	67.5101739
716	162635 (2000 SS164)	55200	2.58015069	0.509149792	7.8082203	311.2242654	154.1401583	57.0976795
717	162679 (2000 TK1)	55200	1.19950724	0.571857747	29.2333774	167.3128774	13.0523283	238.7336851
718	162687 (2000 UH1)	55200	1.87605241	0.543417173	14.7986043	40.7017475	76.3322603	181.4028668
719	162694 (2000 UH11)	55200	0.87028308	0.422362473	32.2270887	187.3752783	29.8137888	288.2109045
720	162695 (2000 UL11)	55200	2.12292491	0.636719825	2.1882103	151.5680346	333.4392043	325.6487879
721	162698 (2000 UN30)	55200	2.1190302	0.487424489	20.6975577	271.7209683	66.3856755	13.4532603
722	162723 (2000 VM2)	55200	1.77441935	0.680890256	6.392293	187.2393602	329.9184076	271.2242015
723	162740 (2000 WF6)	55200	2.46230515	0.502061468	39.0621754	158.8334729	264.4530115	127.8687846
724	162741 (2000 WG6)	55200	2.31962084	0.497659332	11.8172383	329.8453488	60.9321743	213.0320328
725	162781 (2000 XL44)	55200	2.22717281	0.426489206	10.0411389	163.7612244	332.1151276	247.1151232
726	162783 (2000 YJ11)	55200	1.3125043	0.231641856	7.2623319	339.036754	65.0186572	30.1367925
727	162825 (2001 BO61)	55200	1.77522104	0.742136197	9.0848167	78.3753467	160.2157489	247.2071458
728	162854 (2001 DE47)	55200	1.32279413	0.149169456	21.2659093	297.7406206	122.4658066	1.4316987
729	162873 (2001 FB7)	55200	1.40066625	0.086400198	20.1973742	198.608935	357.9436831	97.8552621
730	162882 (2001 FD58)	55200	1.09206745	0.575278751	6.5016467	45.8592836	341.2933915	5.8030327
731	162900 (2001 HG31)	55200	2.58479424	0.530000025	6.1775667	66.8718443	36.9802296	83.9737585
732	162903 (2001 JV2)	55200	1.3047069	0.237682193	47.4851197	301.2486263	216.930344	344.7416023
733	162911 (2001 LL5)	55200	1.20458329	0.339457883	7.9466128	205.0422865	281.9698298	252.5014218
734	162913 (2001 MT18)	55200	1.2709638	0.519773921	8.6423487	356.0398877	170.6073448	48.5143068
735	162922 (2001 OY13)	55200	1.31807716	0.381756335	10.2976599	291.0944878	284.3180571	257.9093956
736	162926 (2001 OB36)	55200	2.93765847	0.619842675	42.6681158	289.1573824	113.0806265	212.8875078
737	162979 (2001 RA12)	55200	2.03574566	0.54526658	17.0830117	325.9814228	311.6710773	328.3560028
738	162980 (2001 RR17)	55200	1.55274322	0.489281347	30.4066725	351.3725459	177.6648036	297.0741276
739	162998 (2001 SK162)	55200	1.92547657	0.473708596	1.6786834	186.2381695	285.531992	349.8862834
740	163000 (2001 SW169)	55200	1.24841132	0.051567518	3.5548929	284.8747599	8.4748181	29.6747913
741	163001 (2001 SE170)	55200	2.12390317	0.453368117	19.9454452	124.6663486	216.7409859	259.1039507
742	163014 (2001 UA5)	55200	1.78686346	0.445544647	9.9484427	27.5100914	58.7262294	140.1767276
743	163015 (2001 UX16)	55200	1.41710894	0.368224765	10.6170665	254.462458	213.4645491	267.1886178
744	163023 (2001 XU1)	55200	0.79737423	0.546273653	27.1569349	208.4957001	69.7342269	240.5661008
745	163026 (2001 XR30)	55200	1.29723754	0.365341773	11.8540482	294.3009728	247.9745492	103.2069404
746	163051 (2001 YJ4)	55200	2.27602715	0.566529107	9.2338884	322.0660464	248.1097572	94.1634188
747	163067 (2002 AP3)	55200	2.04073504	0.589621754	7.5970565	117.5502617	87.5530407	232.3999393
748	163070 (2002 AO7)	55200	2.92235742	0.633388096	14.6674829	237.9430897	280.6422799	194.6242347
749	163081 (2002 AG29)	55200	1.08709269	0.203376517	11.4925152	43.8076359	212.949295	262.2675414
750	163132 (2002 CU11)	55200	1.22014466	0.295438171	48.7748262	110.624332	157.784779	238.3421497
751	163191 (2002 EQ9)	55200	1.83641072	0.463951832	16.3032238	44.1083598	179.2436673	30.807153
752	163243 (2002 FB3)	55200	0.7614624	0.60185446	20.2725866	148.2528241	203.6495117	20.9777958
753	163249 (2002 GT)	55200	1.34455849	0.334932209	6.9682596	134.9668589	201.8720058	245.6792096
754	163250 (2002 GH1)	55200	2.69096805	0.539129232	34.9991726	350.9582902	170.3222972	274.8551788
755	163252 (2002 GD11)	55200	2.13089588	0.439712269	8.9994855	200.8729532	95.7079067	139.5913196
756	163295 (2002 HW)	55200	2.47199985	0.640253164	5.8268042	76.8938856	33.0383739	8.3470844
757	163335 (2002 LJ)	55200	1.32792883	0.667251233	56.2900151	155.6052528	247.0769867	291.0898095
758	163348 (2002 NN4)	55200	0.87661342	0.434343333	5.415679	222.225756	259.5806647	199.2946993
759	163364 (2002 OD20)	55200	1.36415417	0.36896013	4.1748939	274.9207595	260.1454885	347.494943
760	163373 (2002 PZ39)	55200	1.46977202	0.546629928	1.663138	259.2310644	329.7359246	87.1399399
761	163412 (2002 RV25)	55200	1.90713956	0.450539666	34.5027099	46.0899893	18.2233822	253.8151192
762	163454 (2002 RN129)	55200	1.16210676	0.369881312	23.1290138	198.5390848	332.168223	128.7756974
763	163667 (2002 WC1)	55200	2.57331835	0.579224122	4.6445496	81.402838	42.581529	244.2004265
764	163679 (2002 XG84)	55200	1.49504292	0.471644758	5.0594067	349.6036445	29.8498028	336.5396962
765	163683 (2002 YP2)	55200	1.57746651	0.688413055	20.6119598	281.2027812	52.6875314	224.2950296
766	163691 (2003 BB43)	55200	2.41331807	0.523170329	40.9163941	60.5661361	149.1279814	288.8946238
767	163692 (2003 CY18)	55200	1.52606683	0.41058155	7.1982724	180.7699397	114.4665154	133.4167699
768	163693 Atira	55200	0.74105598	0.322149656	25.6179993	252.9169753	103.939465	75.8562873
769	163694 (2003 DP13)	55200	2.63654186	0.545981677	9.8192621	283.0532682	326.8715651	190.5033668
770	163696 (2003 EB50)	55200	1.57075885	0.519314279	29.4966957	278.8613948	65.7398566	25.9636671
771	163697 (2003 EF54)	55200	1.60885276	0.472615872	2.9491172	353.5867323	268.5833604	89.0582905
772	163732 (2003 KP2)	55200	2.75277245	0.696089839	44.6410099	190.6092935	193.415529	131.2170766
773	163758 (2003 OS13)	55200	1.29597771	0.740896114	41.5627117	244.1938231	272.2916619	168.632208
774	163760 (2003 OR14)	55200	2.51601554	0.500100868	13.0581546	211.7622664	211.5685944	172.6949855

#	Object	Epoch	a	e	i	w	Node	M
775	163818 (2003 RX7)	55200	1.22947009	0.354641675	10.3884364	245.7708119	241.1246475	123.7234899
776	163899 (2003 SD220)	55200	0.82818551	0.209810006	8.462737	326.2932712	274.1605728	259.5688934
777	163902 (2003 SW222)	55200	1.66082361	0.247784873	16.1070184	164.9064502	283.7868193	314.5124397
778	164120 (2003 YK)	55200	1.51153704	0.407911985	11.0382188	189.4485318	345.6968922	33.3920735
779	164121 (2003 YT1)	55200	1.10985166	0.291908601	44.0616226	90.9796984	38.3549125	2.5548022
780	164184 (2004 BF68)	55200	1.62704675	0.453551814	4.5993131	2.4061815	202.2757471	282.7343735
781	164201 (2004 EC)	55200	1.99749437	0.859561921	34.6187911	10.2546426	28.8648785	37.1232594
782	164202 (2004 EW)	55200	0.98937799	0.279678217	4.6630882	55.7341403	343.398008	64.2688721
783	164206 (2004 FN18)	55200	1.70105878	0.409328534	18.2822082	232.6974392	214.524841	292.0791107
784	164207 (2004 GU9)	55200	1.00090305	0.136389279	13.6481918	280.8531921	38.804261	149.6597048
785	164211 (2004 JA27)	55200	1.66596171	0.423207853	2.2585792	270.089773	67.8357744	174.0680775
786	164214 (2004 LZ11)	55200	2.11956566	0.393086487	5.4668818	248.4986873	72.3103057	266.5737197
787	164215 Doloreshill	55200	2.1147306	0.396920275	4.8791327	76.1965611	236.3012078	275.9869527
788	164216 (2004 OT11)	55200	2.1538184	0.563687992	19.8916085	326.1669716	295.2863045	281.4053069
789	164217 (2004 PT42)	55200	2.01264157	0.416037893	48.9014772	178.9636731	145.0247366	318.900906
790	164221 (2004 QE20)	55200	1.50513799	0.20537168	6.4828631	74.1820814	272.6669842	320.3746629
791	164222 (2004 RN9)	55200	1.30484445	0.247281994	16.1127306	67.114904	1.0156303	152.5205831
792	164294 (2004 XZ130)	55200	0.61764408	0.454383514	2.9533971	4.7852276	211.7803893	328.1873043
793	164341 (2005 CO)	55200	1.62696571	0.254072518	13.0143068	42.7318514	140.7336265	105.528674
794	164342 (2005 CP)	55200	1.56994422	0.361096791	19.1727963	72.8534339	139.0272426	142.4823161
795	164400 (2005 GN59)	55200	1.65617734	0.467695018	6.6268607	202.9008808	219.045141	193.5474405
796	168044 (2005 SG)	55200	0.98105039	0.283100811	34.8384107	205.4822294	23.552474	207.4167608
797	168318 (1989 DA)	55200	2.16346534	0.543592204	6.494188	139.6860828	349.233333	209.397333
798	168378 (1997 ET30)	55200	2.13702809	0.449613105	6.8145463	263.2043328	23.444596	323.1926366
799	168791 (2000 SQ43)	55200	2.29397701	0.506831709	5.179228	144.6853403	171.0000605	260.7356881
800	169352 (2001 UY16)	55200	2.08193395	0.518129354	32.3088769	48.3413504	32.318659	244.6069896
801	169675 (2002 JM97)	55200	2.73518847	0.54047031	12.6793084	235.7524872	64.1088389	235.9310636
802	170013 (2002 UO3)	55200	2.96719956	0.799978472	24.3487468	329.1037005	185.1418853	130.2847299
803	170086 (2002 XR14)	55200	1.90426034	0.626052389	2.130438	120.0836565	75.6803052	206.3437691
804	170502 (2003 WM7)	55200	2.48488729	0.877982319	10.2493342	143.1604398	49.0443954	172.1393222
805	170891 (2004 TY16)	55200	1.98375463	0.40445307	8.148274	177.2999588	329.9525336	239.2933217
806	170903 (2004 WS2)	55200	1.33657646	0.603098373	8.2581277	115.197303	87.8657434	63.1656994
807	171486 (1996 MO)	55200	1.79381759	0.512761869	6.0867311	4.644992	165.1822343	290.4621628
808	171576 (1999 VP11)	55200	1.08429425	0.583454496	17.2963557	61.54041	208.1834916	81.9767154
809	171819 (2001 FZ6)	55200	1.49578729	0.166489958	9.9513576	297.2867186	17.4320265	160.2047043
810	171839 (2001 JM1)	55200	1.46092309	0.311105502	17.0666864	321.7948387	226.7336973	344.7691468
811	172034 (2001 WR1)	55200	1.27710722	0.202463811	25.0331021	48.4998561	6.5602168	215.6768152
812	172678 (2003 YM137)	55200	2.60320051	0.685718365	2.6904757	126.8185712	77.2999969	133.2360085
813	172718 (2004 BD85)	55200	1.60983856	0.204802263	19.5690825	284.2964088	267.4548947	274.7713728
814	172722 (2004 BV102)	55200	1.54369353	0.699527593	7.2328324	17.0454805	341.4091995	59.3296981
815	172974 (2005 WY55)	55200	1.6369274	0.246690963	8.4712476	256.6427944	239.4645678	313.4372496
816	173232 (1998 XC9)	55200	2.74791075	0.32323572	9.3191994	120.8209793	320.2064645	154.5756638
817	173561 (2000 YV137)	55200	1.44768114	0.310721345	28.0067178	211.2943521	137.2858646	155.1913088
818	173664 (2001 JU2)	55200	1.51737596	0.268567352	4.0118803	227.0419529	100.9699057	158.5586413
819	173689 (2001 PK9)	55200	1.77969265	0.394495865	10.4067234	313.5858181	273.1398982	255.87374
820	174050 (2002 CC19)	55200	1.28469057	0.113322605	50.0620391	20.0759713	134.7709261	123.4402511
821	174806 (2003 XL)	55200	2.5214119	0.573514465	11.3076119	205.2308939	318.9394738	150.1652411
822	174881 (2004 BU58)	55200	1.25390129	0.557197259	57.2255165	171.7638838	120.1960834	320.144978
823	175114 (2004 QQ)	55200	2.2491553	0.665487682	5.7490021	31.1909009	288.3891571	223.7879199
824	175189 (2005 EC224)	55200	2.0559565	0.387340151	2.6243538	78.4038656	169.6297248	168.325052
825	175706 (1996 FG3)	55200	1.0544643	0.349904805	1.9903112	23.9497346	299.8322952	155.0927306
826	175729 (1998 BB10)	55200	1.27215383	0.424829604	11.5366412	259.116381	124.3770967	169.8907529
827	175921 (2000 DM1)	55200	1.36895747	0.483970216	20.6935349	306.6242061	342.8539246	340.889832
828	177016 (2003 BM47)	55200	1.15988025	0.582083307	13.8003783	155.2771963	137.6476691	90.1467078
829	177049 (2003 EE16)	55200	1.41753844	0.614177987	0.649001	259.6703779	127.0027503	91.5801707
830	177255 (2003 WC25)	55200	2.29581895	0.484059527	10.2449859	9.3190929	347.8012549	305.3894101
831	177614 (2004 HK33)	55200	1.88778735	0.520981176	5.4446034	221.2849006	104.9004602	43.3744421
832	177651 (2004 XM14)	55200	1.15428954	0.698808201	42.4060566	186.3228966	89.4450826	115.1677416
833	178601 (2000 CG59)	55200	2.47406074	0.490521239	4.1802366	29.5454008	28.7398324	229.1620286
834	178871 (2001 MA8)	55200	2.36848617	0.466237085	7.6129304	357.2626785	269.7435472	133.2318404
835	179806 (2002 TD66)	55200	1.85837156	0.533959625	4.9203166	125.5834758	335.7756759	278.8953287
836	180186 (2003 QZ30)	55200	2.41944326	0.630760882	8.5704002	243.003623	178.1981663	225.2183796
837	183548 (2003 HU42)	55200	1.84457004	0.340197845	10.5318529	196.2110811	203.156224	60.6082855
838	184266 (2004 VW14)	55200	2.12094617	0.600579769	3.8568356	41.9874876	101.3712626	215.2829417
839	184990 (2006 KE89)	55200	1.0533209	0.799350531	45.0723445	299.1572492	88.7072413	72.8826634

#	Object	Epoch	a	e	i	w	Node	M
840	185702 (1998 HK3)	55200	1.82838663	0.299846879	24.6993679	267.54676	27.1958806	203.6155788
841	185716 (1998 SF35)	55200	1.68530562	0.273591844	35.1893887	253.771481	218.6410632	342.447222
842	185851 (2000 DP107)	55200	1.36545291	0.376615914	8.6702972	289.6735336	358.7775181	326.134967
843	185853 (2000 ER70)	55200	1.85747233	0.310751792	36.9004776	338.5636354	111.6573814	329.4346976
844	186822 (2004 FE31)	55200	1.57308319	0.45244631	13.056767	150.2248187	200.834523	197.2925255
845	186823 (2004 FN32)	55200	1.20505133	0.676949584	21.9521296	161.0663434	190.1204138	43.3370487
846	186844 (2004 GA1)	55200	2.43766361	0.669187154	7.7893038	54.2617448	261.890505	152.7103237
847	187026 (2005 EK70)	55200	0.95958785	0.135449077	30.0031695	347.0377395	329.8297641	186.8112462
848	187040 (2005 JS108)	55200	1.35596886	0.32247655	6.0407029	243.7901868	110.9315707	258.3751557
849	188174 (2002 JC)	55200	0.81890624	0.390925136	40.8504268	306.9005523	69.4204057	302.9516537
850	188452 (2004 HE62)	55200	2.55725053	0.567187095	24.6988877	21.016687	303.0479606	120.7646412
851	189008 (1996 FR3)	55200	2.16624087	0.794775436	8.1111193	36.2810626	27.5515671	145.3423254
852	189011 Ogmios	55200	1.5000943	0.232206348	18.6939057	130.2736997	254.4888979	200.6342871
853	189040 (2000 MU1)	55200	1.37317627	0.382628084	13.0966451	63.5262756	130.1570808	16.2993999
854	189058 (2000 UT16)	55200	2.57271141	0.509724557	26.2332047	91.1873331	257.464349	104.8338643
855	189062 (2000 VA45)	55200	1.92748978	0.387330153	12.8462174	287.3113551	35.2361041	184.1552365
856	189173 (2002 XY4)	55200	1.84364085	0.570509459	43.0715107	273.7296857	269.0390315	264.3540785
857	189263 (2005 CA)	55200	2.72986935	0.588444486	16.7469177	203.9394486	202.1410678	68.0997296
858	189552 (2000 RL77)	55200	2.55641218	0.534896128	30.2953367	234.4060379	194.9325998	84.3802879
859	189630 (2001 LE6)	55200	1.20608008	0.693146898	12.635756	201.4693473	290.6097639	230.8857067
860	189700 (2001 TA45)	55200	1.46291163	0.19134117	10.7210146	126.5561665	204.9796263	278.1355454
861	189865 (2003 NC)	55200	1.40563773	0.805663628	21.6499629	224.0845528	288.6491295	2.0398268
862	189973 (2003 XE11)	55200	1.84471791	0.376984781	26.9476928	173.0446857	223.5271497	146.3909235
863	190119 (2004 VA64)	55200	2.46261972	0.890881385	30.0396631	19.855981	225.5691356	135.8319197
864	190135 (2005 QE30)	55200	2.01686693	0.689143605	6.2388397	216.8641472	259.956093	126.1342872
865	190161 (2005 TJ174)	55200	2.23799112	0.454382674	3.9926748	55.5863337	305.1107523	116.67748
866	190166 (2005 UP156)	55200	2.11671856	0.468429888	4.2069125	90.9974222	193.6022315	201.7546874
867	190208 (2006 AQ)	55200	2.05353899	0.486559392	4.0804017	104.7904407	326.215022	114.7260358
868	190491 (2000 FJ10)	55200	1.31752021	0.233747229	5.285663	232.1133576	189.9193212	266.9098979
869	190758 (2001 QH96)	55200	1.74939688	0.364444509	13.9458091	130.2980702	178.6946523	239.4191572
870	190788 (2001 RT17)	55200	1.26824805	0.792043019	20.1383731	199.5197254	350.0690779	24.0391554
871	191094 (2002 EA3)	55200	2.11358341	0.641704103	32.1990849	259.1063216	349.7410797	178.90878
872	192559 (1998 VO)	55200	1.07460912	0.226586411	10.0605329	75.899039	228.2109913	84.6466801
873	192563 (1998 WZ6)	55200	1.45221302	0.40804037	24.7489999	110.5893585	68.8125543	64.8407374
874	192642 (1999 RD32)	55200	2.63841486	0.770920146	6.7950282	299.7746753	310.1840551	166.0470653
875	193178 (2000 PK5)	55200	1.93557977	0.700264065	13.1188701	191.6557197	227.2632062	150.3503812
876	194006 (2001 SG10)	55200	1.44867571	0.424248614	4.2554165	101.501645	185.0740264	302.3081389
877	194126 (2001 SG276)	55200	1.43275565	0.247530887	26.6809049	200.2629637	35.159753	44.7682014
878	194268 (2001 UY4)	55200	1.45320696	0.787216088	5.429058	107.4120938	161.0758254	275.7102112
879	194386 (2001 VG5)	55200	2.30184993	0.614145259	13.6255374	279.0808996	249.5079636	82.1886007
880	196068 (2002 TW55)	55200	2.11719631	0.663967146	59.3963342	251.1731935	33.6616931	157.5580361
881	196256 (2003 EH1)	55200	3.12477915	0.618798337	70.8019451	171.3367762	282.9665814	87.0086667
882	196625 (2003 RM10)	55200	1.84716604	0.591255561	13.7212561	287.0774162	341.5312887	206.898628
883	197588 (2004 HE12)	55200	1.84481997	0.466773714	42.7230235	162.1088932	338.0966589	106.419522
884	198752 (2005 EA60)	55200	2.51670451	0.519443075	1.7554409	115.8218184	335.0839037	96.9956568
885	198856 (2005 LR3)	55200	1.6536549	0.335146213	25.0051158	26.2821641	73.864871	183.1893611
886	199003 (2005 WJ56)	55200	0.95892879	0.152052268	21.6152475	297.5895889	288.0921791	299.6712049
887	199145 (2005 YY128)	55200	1.64941878	0.731766377	3.7614329	314.5145478	300.5540513	269.3458246
888	199801 (2007 AE12)	55200	1.68494536	0.569641772	2.2829849	86.5638888	245.8171088	214.1041015
889	200754 (2001 WA25)	55200	1.75612537	0.517031579	15.514779	83.5254515	279.9748767	194.1775734
890	200840 (2001 XN254)	55200	2.32072399	0.561807915	1.9264383	274.7397745	267.5567145	71.7360756
891	202411 (2005 RC)	55200	2.15002319	0.752875618	16.335355	40.3074784	192.2418729	160.3890923
892	202435 (2005 XH8)	55200	1.32239577	0.691610304	29.0456828	159.0319177	79.7603395	188.8869111
893	202683 (2006 US216)	55200	0.63672837	0.562712505	3.4166608	56.2833622	193.3683071	227.5505602
894	203015 (1999 YF3)	55200	1.48697627	0.143378423	26.762369	147.0296631	298.9471339	197.883741
895	203217 (2001 FX9)	55200	1.93203201	0.331329969	3.4944844	291.9024033	184.5448008	131.1323329
896	203471 (2002 AU4)	55200	0.85562465	0.373572189	17.180445	205.1664755	99.5063745	208.3020204
897	204131 (2003 YL)	55200	1.14601771	0.632484017	5.6593647	29.2944444	292.0542657	31.055244
898	204232 (2004 DG2)	55200	1.24752682	0.563498454	17.3346835	343.3092622	329.3125875	324.6350918
899	205378 (2001 BJ16)	55200	1.36336403	0.141465467	19.3583945	209.9284512	134.6310862	355.3031767
900	205388 (2001 DV8)	55200	1.37351248	0.17087098	12.3685735	212.6691833	325.4556801	168.1363084
901	205744 (2002 BK25)	55200	2.29548805	0.749015824	11.9288255	103.6925532	156.3999056	75.1544323
902	206359 (2003 QM47)	55200	1.79212139	0.303710574	33.1100947	302.9872077	149.1995149	160.1114015
903	206378 (2003 RB)	55200	1.79003	0.439629991	6.7406189	43.7201444	317.3343398	222.6361656
904	206910 (2004 NL8)	55200	2.56568091	0.720987177	4.974173	270.8541984	157.6730813	92.7637876

#	Object	Epoch	a	e	i	w	Node	M
905	207398 (2006 AS2)	55200	2.09698591	0.63656804	2.5934099	79.4007902	126.1406714	92.9324085
906	207945 (1991 JW)	55200	1.03832836	0.118445282	8.714077	301.6593515	53.9467288	107.1789884
907	207970 (1996 BZ3)	55200	2.6425971	0.524024365	3.3722173	278.1206341	178.3682068	95.9230061
908	208023 (1999 AQ10)	55200	0.93400984	0.235713178	6.5006277	300.4311595	327.1925908	257.5425629
909	208115 (2000 CT101)	55200	1.29957982	0.354736731	23.2929272	292.3428932	135.6232715	285.606619
910	208565 (2002 CT11)	55200	1.25805843	0.53836709	53.8673132	24.8489253	6.085236	278.6980076
911	208617 (2002 EB3)	55200	1.75772823	0.684395317	9.9106543	300.0612368	1.7755642	92.6827606
912	209215 (2003 WP25)	55200	0.98991444	0.12104326	2.560079	226.0036549	40.868855	217.3182041
913	209924 (2005 WS55)	55200	2.02867014	0.453954907	23.79041	203.2505011	283.6944048	95.4242157
914	210012 (2006 KT1)	55200	2.30517999	0.474654631	9.2672189	188.8927603	138.7581237	322.7646346
915	211871 (2004 HO)	55200	1.84542274	0.511244751	7.8713002	163.675571	146.1993578	53.018568
916	211914 (2004 RM251)	55200	2.6121596	0.59829249	19.3352607	110.0515693	350.4080141	70.40741
917	212359 (2006 EV52)	55200	2.01586874	0.70794271	15.9431935	167.060438	168.5783632	11.269178
918	212546 (2006 SV19)	55200	2.13258466	0.514852725	7.3471597	182.2304506	116.2896982	49.2574659
919	213053 (1998 WT30)	55200	1.813183	0.337066765	0.5138402	126.6095792	35.9313016	134.120233
920	213869 (2003 SG170)	55200	1.85933162	0.604370726	36.9404331	309.1683464	199.3963495	114.0018273
921	214088 (2004 JN13)	55200	2.86828083	0.698128265	13.3383911	275.6800001	88.4878867	7.0904617
922	214869 (2007 PA8)	55200	2.82818319	0.661687121	1.9854707	291.8367446	143.0511947	140.2606578
923	215167 (2000 EL26)	55200	1.69002104	0.308964633	26.9704178	96.7615137	152.4264983	115.6603051
924	215188 (2000 NM)	55200	2.68490018	0.662696692	22.4783374	69.9493106	274.7585074	45.6839932
925	215442 (2002 MQ3)	55200	0.91368529	0.274274733	36.2837078	346.8749147	109.0961917	17.9645924
926	215588 (2003 HF2)	55200	1.11353541	0.675361726	3.0564689	230.8470765	152.0315779	346.8367225
927	215757 (2004 FU64)	55200	1.8372651	0.367256665	24.880238	286.3503288	20.9791049	48.1160055
928	216115 (2006 SU19)	55200	1.52696129	0.586323758	2.0896897	10.5067829	152.2704233	151.9346156
929	216258 (2006 WH1)	55200	1.67347484	0.48571428	2.6411282	263.018872	240.8227315	126.0595447
930	216523 (2001 HY7)	55200	0.91384449	0.412009453	5.2080767	211.122744	205.2536698	117.4040035
931	216689 (2004 HM1)	55200	2.76008598	0.533826258	4.1629457	159.6425587	152.0315779	47.3000915
932	216707 (2004 XP164)	55200	2.17743805	0.412812144	22.6541419	310.2899122	127.029205	224.4983086
933	216985 (2000 QK130)	55200	1.1806022	0.261784114	4.7224137	66.2632825	173.9566488	169.0513303
934	217013 (2001 AA50)	55200	1.32055055	0.19772185	43.8839215	58.5794966	306.2793151	69.9712268
935	217390 (2005 CW25)	55200	1.6260188	0.478009073	28.4748483	108.8456583	148.4318183	88.7101444
936	217430 (2005 SN25)	55200	1.2300316	0.270608123	13.011304	45.0564516	168.3599561	179.7800968
937	217628 (1990 HA)	55200	2.55415146	0.702788509	4.0151454	310.0907302	183.1938589	293.0630741
938	217683 (1999 RP36)	55200	2.22691702	0.417563518	5.4853395	321.4761072	57.9596985	26.994106
939	217796 (2000 TO64)	55200	2.74948168	0.617044876	37.4188481	177.6571708	223.756058	11.9992626
940	217807 (2000 XK44)	55200	1.7238014	0.385175629	11.2357358	347.4783902	48.1707265	29.2198074
941	217837 (2001 LC)	55200	1.0545359	0.677420956	16.9663099	2.4364389	112.4229594	34.6559624
942	218017 (2001 XV266)	55200	1.19665482	0.192901293	12.0010838	265.0498244	214.1596582	352.9646516
943	218863 (2006 WO127)	55200	2.19332198	0.550147318	10.995084	314.1549868	167.7682183	348.2715335
944	219021 (1991 LH)	55200	1.3566406	0.732695396	53.1597005	203.7731996	281.0678754	17.9745215
945	219071 (1997 US9)	55200	1.05262977	0.281961095	20.0165442	357.3301047	212.254129	289.9109047
946	219527 (2001 QK142)	55200	2.48594222	0.535444544	5.7710026	319.4018706	40.7183755	49.6737943
947	220124 (2002 TE66)	55200	1.4568148	0.378183107	51.3413396	290.5979721	191.0425363	346.6025167
948	220839 (2004 VA)	55200	1.90055103	0.596665159	3.6984026	43.1125959	109.6966186	310.0106514
949	220909 (2005 E01)	55200	2.53498577	0.705196745	13.8873728	40.8543103	231.2534085	45.3888322
950	221455 (2006 BC10)	55200	2.01324302	0.660240322	0.9364289	233.4184202	21.7453029	82.1762948
951	221787 (2007 VZ30)	55200	1.60472755	0.194536521	2.4546952	99.1891557	344.7408885	355.0178437
952	221980 (1996 EO)	55200	1.34146689	0.400496526	21.5995016	64.5956819	356.5527705	27.8150937
953	222008 (1998 QQ63)	55200	2.36319996	0.550461393	1.6682685	265.5114227	104.4614214	39.2948192
954	222073 (1999 HY1)	55200	1.38626149	0.130722961	34.2257662	89.8588222	216.145328	116.7189669
955	222165 (2000 AX93)	55200	2.20832998	0.480455679	23.3615035	234.1445664	291.1413142	0.1200072
956	222869 (2002 FB6)	55200	1.79635163	0.54494064	33.7056972	101.7826926	182.8184008	58.2198534
957	223456 (2003 UB10)	55200	1.60005552	0.335830256	5.1436121	105.1423935	131.0877851	151.3076825
958	224926 (2007 DA41)	55200	1.46116579	0.439589301	30.2262821	20.1743851	225.9621336	166.4852259
959	(1972 RB)	55200	2.14927671	0.487419149	5.2350771	152.6024522	177.3006112	306.2654128
960	(1979 XB)	44222	2.37177026	0.727676573	25.251436	75.3491719	86.0167002	347.9616113
961	(1982 YA)	55200	3.6425861	0.692794057	35.1271051	144.2973004	269.0583518	324.3693497
962	(1983 LC)	55200	2.61438971	0.708842997	1.5203068	184.8611784	159.5628915	87.19985
963	(1984 QY1)	45941	2.96297981	0.917043104	15.4854355	335.3854044	144.0908689	348.2307196
964	(1985 WA)	55200	2.84189938	0.602981974	9.7634132	351.1112483	43.6135585	20.0387535
965	(1986 NA)	46621	2.1193115	0.448861082	10.3276525	35.5552392	244.1071299	2.6962322
966	(1987 SF3)	55200	2.25251305	0.536170111	3.3418267	134.4843629	187.1187885	221.1140537
967	(1987 WC)	55200	1.36204339	0.233861938	15.8417262	308.2172369	51.8877004	9.3529497
968	(1988 NE)	55200	2.26822608	0.449936449	9.7088031	3.7360589	251.4536227	111.4091094

#	Object	Epoch	a	e	i	w	Node	M
969	(1988 TA)	55200	1.54117533	0.478824622	2.5416988	104.783383	195.0578776	65.4764313
970	(1989 AZ)	55200	1.64759245	0.468355434	11.7827951	111.7872484	295.6353702	357.0583454
971	(1989 UP)	55200	1.86458463	0.472518053	3.8570248	17.5096554	53.2763759	323.6109231
972	(1989 VB)	55200	1.86467958	0.461090917	2.1339046	329.774817	38.8594378	341.3110908
973	(1990 SM)	55200	2.10065673	0.765974549	11.5795729	107.0171772	136.8544573	139.0879874
974	(1990 UA)	55200	1.64027498	0.525912304	0.9263267	202.5155874	104.2475731	77.6591079
975	(1990 UN)	48191	1.71062389	0.528308164	3.6860811	97.0012205	8.4695527	336.3367937
976	(1990 UO)	55200	1.25705531	0.77323149	31.5312862	333.4303951	205.6566124	154.3230872
977	(1990 UP)	48190	1.32102843	0.167413993	27.8810034	293.2935095	33.298969	50.2266865
978	(1991 BA)	48274	2.18771489	0.67302591	1.9375536	70.6868126	118.8801162	346.8238495
979	(1991 FB)	55200	2.37082421	0.566637438	9.0386636	220.0054866	18.0587488	35.5831707
980	(1991 GO)	55200	1.92588876	0.654188418	9.5565568	89.5442744	24.2028064	23.3963594
981	(1991 JR)	48388	1.40343154	0.259820665	10.1127632	206.9957153	60.224427	339.2238794
982	(1991 RJ2)	55200	2.20943644	0.428799351	8.9432378	150.8716773	171.845432	216.5425495
983	(1991 TT)	48536	1.19565447	0.162031492	14.8549632	217.6109989	192.5214383	333.5363401
984	(1991 TU)	48536	1.42188898	0.335202267	7.7414912	220.7051171	193.5510164	339.9594715
985	(1991 TB2)	55200	2.04499492	0.79229422	7.9479445	199.3061163	292.0098057	58.7160359
986	(1991 TF3)	55200	2.23249481	0.569479436	14.867396	303.9632617	6.2355472	186.7446518
987	(1991 VA)	48564	1.43118979	0.353272706	6.547183	313.3434583	37.6560673	23.9390507
988	(1991 VG)	55200	1.02692391	0.04916263	1.4455755	24.5549368	73.9760913	113.0814769
989	(1991 XA)	48597	2.24408304	0.56353784	5.2168965	308.4394676	77.2470251	12.1440953
990	(1991 XB)	55200	2.93950245	0.589793415	16.3106326	172.3137933	250.3830079	207.7495948
991	(1992 BC)	48654	1.42243946	0.352708588	14.3675876	76.9472118	123.5541043	325.6855178
992	(1992 DU)	48679	1.16074905	0.175492485	25.1053967	121.7213505	338.0008762	42.6953203
993	(1992 JD)	55200	1.03475792	0.031713658	13.5398383	286.0200835	222.5861813	355.5703954
994	(1992 SZ)	55200	2.17794052	0.458412569	9.2872487	314.9520055	4.2657801	149.8093274
995	(1992 VD3)	48983	1.16200808	0.1343195	26.9131356	173.2983352	274.3686122	5.143216
996	(1993 BD2)	55200	2.12368716	0.394226179	25.5501524	65.4183638	96.9926226	142.2501325
997	(1993 BD3)	49016	1.63499724	0.375107616	0.8889416	168.387522	314.0279327	3.0165174
998	(1993 BU3)	55200	2.40664485	0.513692958	5.2948549	144.3052326	316.2655849	201.5951051
999	(1993 DA)	55200	0.93554984	0.093404899	12.3779098	354.2758496	329.1764069	60.6175799
1000	(1993 FS)	55200	2.22529762	0.42566181	10.1411477	20.7860028	179.3314498	14.6022268
1001	(1993 FA1)	49076	1.42660162	0.289079546	20.460234	343.4577925	187.3885862	10.0853944
1002	(1993 GD)	55200	1.10253182	0.238149686	15.4614366	202.0138338	201.4925157	302.7242672
1003	(1993 HC)	55200	1.98799194	0.509525735	9.4182902	306.7736067	201.1792423	4.5954215
1004	(1993 HD)	49098	1.12632164	0.039145426	0.5520699	83.6934894	116.1875182	9.2201926
1005	(1993 HP1)	49104	1.97645682	0.507726266	7.950059	151.7402389	37.0670894	8.0877075
1006	(1993 KA)	55200	1.25562133	0.197635773	6.045213	341.9726985	235.8340943	309.7597444
1007	(1993 KA2)	49128	2.22657603	0.774927548	3.1949078	261.2420187	239.6304376	13.763494
1008	(1993 RA)	55200	1.91871287	0.415724799	5.6026278	265.0424622	171.8660588	3.3174688
1009	(1993 TZ)	49276	2.03339696	0.565355121	4.1768281	230.9338668	203.7658702	346.9043907
1010	(1993 TQ2)	55200	1.98568802	0.419970805	6.0408168	77.485535	13.4552629	261.8001409
1011	(1993 UA)	55200	2.02238806	0.525930926	4.5966416	330.2976487	26.9859025	236.3467792
1012	(1993 UD)	55200	1.31972606	0.194446571	22.7936597	254.8750211	25.0753676	339.462797
1013	(1993 VC)	55200	2.77452624	0.532698563	3.2077668	177.0884112	242.4072262	171.1694099
1014	(1993 VD)	55200	0.87613232	0.551378539	2.0625852	253.690359	2.6997326	534.9037749
1015	(1994 AW1)	55200	1.1047414	0.075428166	24.0991364	37.0697637	290.4092698	55.2939906
1016	(1994 BB)	49374	2.0227089	0.425526661	1.1395449	335.954325	122.6432794	8.4291462
1017	(1994 CB)	55200	1.14910857	0.145025917	18.2566093	288.375863	310.7074743	243.6622317
1018	(1994 CJ1)	55200	1.48908073	0.324875537	2.3056223	64.984141	172.2500759	209.9881495
1019	(1994 EK)	49424	2.15531112	0.642199422	6.0305802	97.3115741	334.7059679	25.4159953
1020	(1994 EU)	49426	1.37776029	0.2782871	6.4801772	145.4576447	351.6905195	21.0287049
1021	(1994 ES1)	49426	1.38061642	0.58420497	1.1465073	279.9503861	353.410402	327.5378806
1022	(1994 FA)	49429	1.73692337	0.418424344	12.9462406	153.1963561	355.8032181	10.9196252
1023	(1994 GK)	49450	1.92059901	0.597122697	5.6026292	111.4777172	15.400906	17.3688867
1024	(1994 GL)	49450	0.68441915	0.502117082	3.6341904	179.0532962	197.2221505	179.784604
1025	(1994 GV)	55200	2.0087694	0.520771409	0.4566295	153.9138695	20.2289768	195.1197234
1026	(1994 JX)	55200	2.76184194	0.572673311	32.1701487	193.4942643	52.5007537	147.859902
1027	(1994 NE)	55200	2.04441369	0.606191064	27.5374758	246.4147011	104.7390119	93.865707
1028	(1994 NK)	55200	2.34833706	0.541045871	5.6796383	128.6688557	119.9863557	119.4573553
1029	(1994 RB)	49597	2.47667257	0.637702007	26.5884485	52.4723252	339.6528146	350.1618642
1030	(1994 RC)	55200	2.26877677	0.600350571	4.7325689	284.5387631	345.9516229	194.4824783
1031	(1994 TA2)	55200	2.63536505	0.523420243	7.0016092	119.2354722	201.096058	219.4598651
1032	(1994 TE2)	49637	2.24532756	0.441047566	5.684095	185.2649765	198.7903049	359.3309082
1033	(1994 UG)	55200	1.23845436	0.292507824	5.2080493	225.455639	13.7431231	143.1644315

#	Object	Epoch	a	e	i	w	Node	M
1034	(1994 US)	55200	2.73607586	0.568313888	8.4916974	121.4530721	223.6244148	142.6141744
1035	(1994 VH8)	49657	1.61790952	0.437576426	3.3287334	313.6291685	38.4633591	17.4023433
1036	(1994 WR12)	49709	0.75686007	0.397303275	6.8638137	205.6811219	63.0690773	168.8386434
1037	(1994 XD)	55200	2.34954884	0.733418535	4.3074845	249.2307206	96.3705605	82.5134745
1038	(1994 XG)	55200	1.57961916	0.498232944	11.4723526	46.4556311	231.8170813	316.3296574
1039	(1994 XL1)	55200	0.67084094	0.526263568	28.1620171	356.5308051	252.6918881	353.0048414
1040	(1994 XM1)	49695	2.00388248	0.552638625	5.6135604	41.9926644	77.1492118	349.0713175
1041	(1995 BK2)	49750	2.45114414	0.551773534	24.7677683	349.5773236	131.201806	3.108007
1042	(1995 CR)	55200	0.90674354	0.868483992	4.0371141	322.4233357	342.7536402	29.7975348
1043	(1995 CS)	49754	1.90742518	0.769989505	2.5786986	252.2381569	135.6717649	18.1495152
1044	(1995 DV1)	49776	2.76420978	0.650657697	3.4945702	284.0377419	172.5050368	11.7894532
1045	(1995 DW1)	55200	1.04018003	0.436963771	15.0652415	326.9897187	348.8802734	241.9791234
1046	(1995 EK1)	55200	2.26538593	0.775646545	8.8570776	296.8364129	355.4467773	103.4335534
1047	(1995 FF)	55200	2.31881503	0.709376383	0.5906672	296.3583254	172.4736377	73.6960974
1048	(1995 FG)	55200	1.8495986	0.372681525	1.9617081	36.7378829	184.9840025	299.659215
1049	(1995 FJ)	55200	1.08535812	0.270531254	25.0350017	316.4294906	4.7177074	281.2856424
1050	(1995 FO)	55200	1.48858153	0.364591673	11.2383396	272.4993016	180.8457234	105.347271
1051	(1995 FX)	55200	2.25833463	0.541852118	21.5547281	27.4787062	188.4243133	119.716436
1052	(1995 HM)	55200	1.45989839	0.219861804	3.9893202	208.9825599	45.3278645	94.2183281
1053	(1995 LA)	55200	2.12403003	0.519145747	8.6838005	17.5402662	247.7038656	253.2142166
1054	(1995 LG)	55200	1.06460278	0.790771867	43.546127	160.0917918	276.4712563	26.1842172
1055	(1995 MA1)	55200	2.61350018	0.585989089	25.8321048	265.7996129	87.8026135	125.2485632
1056	(1995 NA)	49904	1.69843156	0.395314347	12.7106866	33.7659344	276.1929758	348.0851293
1057	(1995 OO)	55200	2.15473072	0.778411116	23.6299612	211.8505272	348.9927781	257.812775
1058	(1995 SA)	55200	2.44967404	0.643752984	20.2327909	51.5513233	171.4134185	316.5661715
1059	(1995 SB)	49982	1.32025235	0.085517144	14.8898565	263.066417	352.0999443	91.4325733
1060	(1995 SC1)	55200	2.12166646	0.47559916	6.82713	341.252749	357.9406802	229.4058728
1061	(1995 SD1)	55200	2.78387605	0.568490641	9.3947968	189.6323653	178.455563	24.9559818
1062	(1995 SA4)	55200	2.50066804	0.578842071	2.818656	148.3265638	187.6388241	227.1160325
1063	(1995 UB)	55200	1.40062175	0.412493669	8.9814809	112.4144508	204.1679757	236.5637361
1064	(1995 UC2)	50014	1.68345633	0.315040996	26.7967608	271.92276	33.2849525	50.5306383
1065	(1995 YR1)	55200	1.6980355	0.827415144	3.560817	109.1183285	107.3314267	90.9242945
1066	(1996 AJ1)	55200	1.31004653	0.781521317	2.538142	238.1683614	91.0729986	171.2657731
1067	(1996 AP1)	50099	1.91211897	0.494411701	5.4525642	323.842356	118.0203089	10.9733497
1068	(1996 AW1)	50101	1.52228987	0.516104325	4.7174241	228.4995778	117.9765847	50.1892627
1069	(1996 AE2)	55200	1.36828317	0.257057261	37.3730183	305.8882737	118.9928763	293.8417524
1070	(1996 BT)	50105	1.19482324	0.829630655	11.8704147	327.837682	297.0874775	321.7209113
1071	(1996 BA1)	55200	1.98430113	0.372607915	6.6576917	178.9539966	321.4087657	350.349339
1072	(1996 BG1)	50107	0.89755766	0.280650428	3.8139909	150.2745571	139.9503183	206.585368
1073	(1996 FS1)	55200	1.44942015	0.761589797	38.866504	224.477789	170.1649084	8.0752985
1074	(1996 FT1)	50165	1.45634599	0.399352367	2.7032302	93.690219	12.4691657	36.5482124
1075	(1996 FO3)	55200	1.4425514	0.290489225	5.8156136	162.6439262	333.6554734	13.0612284
1076	(1996 FQ3)	55200	2.03205044	0.469318622	1.0675475	79.8478823	148.3806644	259.0996386
1077	(1996 GQ)	50188	2.0202514	0.500293085	0.8990308	59.3221741	85.0050836	19.3213565
1078	(1996 GD1)	55200	1.18597685	0.352678822	18.381571	293.5495937	38.1447738	143.3094098
1079	(1996 HN)	55200	2.20386235	0.411353183	8.6073181	25.1809289	203.026278	62.4294264
1080	(1996 JA1)	55200	2.56126609	0.702653525	21.8396662	247.1477264	57.1884976	104.793858
1081	(1996 KE)	55200	2.56754932	0.535314214	24.2579995	197.7952238	56.5289601	107.9841926
1082	(1996 MQ)	55200	2.40237683	0.576470637	3.4516046	29.5222042	262.3839788	220.7735019
1083	(1996 RG3)	55200	1.99954922	0.604922835	3.5695694	300.0354527	158.3062592	216.1106189
1084	(1996 RY3)	50345	1.19413496	0.138612432	36.499818	288.6239445	174.3047637	268.9987344
1085	(1996 SK)	55200	2.43184252	0.79507683	1.9608778	284.1238458	197.6861409	154.3065715
1086	(1996 TC1)	50363	1.86752674	0.720075923	14.5312017	258.8131097	5.0120084	22.8521324
1087	(1996 TP6)	50370	2.64178442	0.649968808	9.4710687	249.9123344	40.0722631	22.2186072
1088	(1996 TD9)	50371	1.33291475	0.403909948	5.0223737	89.486999	206.3809449	42.4572531
1089	(1996 TE9)	55200	1.79315169	0.326064871	21.63875	3.8014172	13.9317729	181.1469397
1090	(1996 TY11)	55200	1.22815827	0.535457924	13.9303351	158.6508778	30.6878994	135.1469835
1091	(1996 VB3)	50401	1.62904766	0.54565228	2.7996264	132.7010738	180.5807572	36.8226929
1092	(1996 VZ4)	50401	1.60740353	0.362719014	24.2937344	15.2841554	49.1245672	354.0871418
1093	(1996 XW1)	55200	1.7256634	0.454345699	30.5827911	264.6061411	247.9294857	239.7715785
1094	(1996 XZ12)	50427	0.97997322	0.499261347	5.6585162	55.816361	251.7413449	72.9065206
1095	(1996 XX14)	55200	2.54987032	0.649984461	10.5614516	185.0203714	195.5809721	88.0218271
1096	(1996 XB27)	55200	1.18882809	0.05796446	2.4654587	57.5361624	179.5587768	227.1685031
1097	(1997 AC11)	55200	0.91311884	0.367981533	31.6790052	141.5558242	116.9692027	205.4182889
1098	(1997 CZ3)	55200	1.40550698	0.540993747	6.6231449	33.457367	314.3191538	359.2731252

#	Object	Epoch	a	e	i	w	Node	M
1099	(1997 CD17)	55200	1.12253972	0.141630771	15.1039298	221.4388674	320.4786133	272.5985926
1100	(1997 EN23)	50523	3.25133322	0.636723924	6.9593687	352.8845123	178.7410093	0.1885911
1101	(1997 GK3)	50547	1.42132375	0.289122861	18.2870531	127.8531852	24.4782847	26.9070645
1102	(1997 GL3)	55200	2.28295289	0.781650954	6.6855399	260.8392699	195.9677357	267.7444293
1103	(1997 GH28)	55200	2.0039623	0.371727945	7.0141106	105.128046	354.533739	218.5081725
1104	(1997 GC32)	55200	2.03248705	0.654908508	5.9125676	149.9987129	177.3406212	112.0790742
1105	(1997 GD32)	55200	2.10409322	0.601447015	5.3022324	225.9823682	55.7524611	40.9914736
1106	(1997 MS)	55200	1.93660576	0.727966657	54.9469038	65.8482913	86.2816239	258.5398443
1107	(1997 PN)	55200	2.22492012	0.421668158	26.4740652	348.5358769	309.6610382	270.9537371
1108	(1997 QK1)	55200	2.79977199	0.640073139	2.8759866	2.5779008	307.0731016	233.6374839
1109	(1997 RT)	55200	2.24552063	0.525790225	6.1947716	6.1221506	325.9935416	242.520726
1110	(1997 TZ16)	50732	2.01952404	0.59786772	3.8101371	66.8593763	14.1762661	344.5189909
1111	(1997 TC25)	50732	2.59193611	0.623564404	0.250838	321.5239	17.907966	7.6717877
1112	(1997 TT25)	55200	2.12374544	0.417236899	7.6184872	17.930153	30.3174326	334.4760649
1113	(1997 UR)	55200	1.45935242	0.312121179	2.2635735	200.2792633	214.030194	319.9612392
1114	(1997 US2)	55200	1.67451754	0.661002638	3.1689049	100.0337286	66.1290335	179.2017739
1115	(1997 UH9)	55200	0.83008417	0.47467365	25.4928162	180.8628857	42.4351337	210.0549609
1116	(1997 UZ10)	50754	2.87536076	0.618806927	12.7782622	358.7828655	38.8286602	0.4981598
1117	(1997 UA11)	50752	2.36910416	0.619354578	3.2883598	138.0766363	212.8886482	9.5091789
1118	(1997 VG)	50755	1.75319041	0.402755657	30.9777172	154.4703303	219.5601886	10.7736095
1119	(1997 VM4)	55200	2.62200646	0.812567484	14.1629628	124.6112117	45.7510167	288.370269
1120	(1997 VN4)	50760	2.43344064	0.558107258	7.5731631	350.4835117	48.5975833	1.6853173
1121	(1997 VG6)	50765	1.60698589	0.563264572	18.4920664	250.5286444	51.9934982	41.7015725
1122	(1997 WB21)	55200	1.46066732	0.317566835	3.3920409	81.699263	281.1507838	338.4859825
1123	(1997 WQ23)	55200	1.73587181	0.494375138	2.4516866	296.3513032	56.0266536	132.184786
1124	(1997 XR2)	55200	1.07695559	0.201257493	7.1726919	84.6170873	250.8152279	6.3898791
1125	(1997 XS2)	55200	2.66579393	0.518799366	19.3890193	24.1950931	74.9537202	277.529798
1126	(1997 XE10)	55200	1.8638607	0.474949522	6.302842	24.7334058	72.6789304	262.585068
1127	(1997 XV11)	55200	1.86723365	0.317688454	44.2609922	270.205709	241.2894849	210.9875417
1128	(1997 YM3)	55200	3.27064788	0.666339658	3.9381266	75.5379113	301.7923741	35.7823606
1129	(1997 YM9)	55200	1.09527641	0.10364979	7.8419594	51.6274218	94.8213716	138.8631151
1130	(1997 YR10)	50813	1.72008428	0.333913716	36.7559744	190.5487086	270.1139624	357.0816492
1131	(1998 BY7)	55200	2.0242672	0.604385908	3.2820272	89.9998047	122.3648791	29.0057836
1132	(1998 BT13)	50840	2.46700925	0.59476349	1.4131819	353.3292565	123.3984793	2.24285
1133	(1998 BR26)	55200	1.64053259	0.489635725	12.2559596	61.934425	130.0770374	221.7768095
1134	(1998 DX11)	50868	2.49892356	0.605566319	6.5310278	162.1685709	335.0052806	3.6059739
1135	(1998 DV20)	50873	1.98291312	0.608141854	19.6842686	261.3458099	150.8093145	28.1775619
1136	(1998 DK36)	50868	0.69227258	0.415987506	2.0171537	180.0423211	151.4620988	183.2529194
1137	(1998 EE3)	50875	2.18622771	0.583249719	6.2438917	224.573609	341.1896713	349.9998129
1138	(1998 EP4)	55200	1.55989083	0.440796655	7.1943221	266.2485422	352.9393179	345.384468
1139	(1998 FL3)	55200	1.26002344	0.247876147	26.3843371	121.309856	180.1607012	29.2617499
1140	(1998 FL5)	55200	1.54458978	0.364928375	14.52664	297.55927	185.9312481	79.858082
1141	(1998 FM9)	55200	2.29025857	0.442139972	10.3595342	32.0730485	162.4942112	138.3825886
1142	(1998 FN9)	55200	1.39640058	0.235683717	14.625373	329.2049281	183.8991864	71.0082287
1143	(1998 FG12)	55200	2.24182549	0.579575964	8.6462205	97.7442195	22.3907646	203.4215742
1144	(1998 FF14)	55200	1.25344329	0.312435021	38.693801	301.176086	359.8800342	58.4768005
1145	(1998 FJ74)	55200	2.38793056	0.538236068	28.1190683	282.9466549	197.1487662	89.9466647
1146	(1998 FX134)	55200	2.25481452	0.430899798	5.2196211	253.7399653	349.7253944	147.6429501
1147	(1998 GC1)	55200	1.44233802	0.293160076	18.754509	117.1740064	19.1026583	313.1136938
1148	(1998 GL10)	55200	3.17826813	0.667974421	8.6829088	287.4379563	193.279201	37.1773689
1149	(1998 HH1)	55200	2.1544109	0.511028696	16.0224459	359.8012319	203.6587593	252.8746513
1150	(1998 HK1)	55200	2.15588864	0.428829837	7.9522853	24.360693	213.7798959	239.3299468
1151	(1998 HM1)	50925	1.41049517	0.360995008	3.2552994	69.4429709	202.4607622	330.1348065
1152	(1998 HE3)	55200	0.87791231	0.440547575	3.3793331	309.3210116	53.6286536	323.7600892
1153	(1998 HJ3)	50926	1.98686712	0.743997618	6.5407172	92.7669001	224.9015749	333.647319
1154	(1998 HM3)	55200	1.24650779	0.062235377	39.3300919	136.9876732	210.8415153	18.9973457
1155	(1998 HN3)	55200	3.11104339	0.617404397	9.2006142	250.6432408	49.226141	19.7521959
1156	(1998 HD14)	55200	0.9633207	0.31265321	7.8090607	260.7857252	183.9326714	224.508989
1157	(1998 HT31)	50937	2.50939518	0.692582006	6.7883949	80.4212025	213.9044975	348.3033303
1158	(1998 HG49)	55200	1.20131002	0.113049886	4.1952745	324.1345447	44.8986706	163.1012178
1159	(1998 HH49)	55200	1.55068454	0.502402193	8.4168022	287.7343515	23.605478	335.2659794
1160	(1998 HK49)	50935	1.40473813	0.344031209	7.9562543	81.4774689	57.3517168	46.3631935
1161	(1998 KH)	50953	1.6541774	0.713644512	26.3418691	64.1227698	45.0705343	31.6738995
1162	(1998 KD3)	55200	2.04377241	0.50943185	29.2843131	324.1862144	241.5889039	1.2528205
1163	(1998 KF3)	55200	2.1278486	0.419799188	27.1308046	332.7638216	226.5992116	284.2360298

#	Object	Epoch	a	e	i	w	Node	M
1164	(1998 KG3)	55200	1.16104521	0.118667761	5.5023411	267.5966253	208.0473139	213.0590435
1165	(1998 KM3)	55200	1.67165675	0.611307568	4.6613918	84.9393231	263.393067	95.0581514
1166	(1998 KN3)	50961	1.60389369	0.887940169	2.3594298	68.8560026	316.4241283	328.6049074
1167	(1998 KO3)	50960	2.62196634	0.772664744	54.6218932	75.3927278	65.2112423	15.8567867
1168	(1998 KH9)	55200	2.20367858	0.457947978	17.6615126	184.9598779	82.7343111	188.2682688
1169	(1998 KJ17)	55200	1.98609109	0.482856735	9.1476051	163.9923836	76.0629597	54.7410495
1170	(1998 KY26)	55200	1.23198437	0.201449873	1.4811175	209.2028581	84.4469493	142.6625195
1171	(1998 LD)	55200	1.44262081	0.173350096	22.5034279	347.7287458	247.2352256	259.7419495
1172	(1998 LE)	50971	1.51717436	0.699428467	9.1373465	132.4900134	237.9182664	331.3392858
1173	(1998 MS2)	55200	1.73291493	0.402741578	19.2326829	320.1725938	268.4725738	38.0019861
1174	(1998 ME3)	55200	2.17862324	0.482154973	5.9921825	165.3175144	129.6123182	203.608426
1175	(1998 MV5)	50990	1.20480633	0.185040692	21.1758408	313.4730976	269.5625404	36.2244873
1176	(1998 MW5)	55200	1.02277585	0.362624046	6.28659	26.6706325	80.4704593	193.4260276
1177	(1998 MR24)	55200	1.95763574	0.445342372	6.0736499	54.6673163	245.1592384	67.5577897
1178	(1998 OK1)	51016	1.34457619	0.422818843	13.8710061	298.6671474	109.8516118	297.354951
1179	(1998 OP4)	51022	2.25887474	0.536272709	13.3321751	167.2782082	126.9191995	2.7375678
1180	(1998 QP)	55200	1.78538186	0.582773318	9.3591774	78.120071	326.7231843	255.4735624
1181	(1998 QQ)	51046	1.23315035	0.680027926	36.726563	220.3278311	325.4469996	65.124782
1182	(1998 QA1)	55200	2.10462694	0.531919816	8.1635138	332.9200031	299.1473203	279.5265531
1183	(1998 QC1)	55200	1.98348095	0.590683668	9.6369643	115.1252633	308.6311009	356.221199
1184	(1998 QH1)	55200	2.53707204	0.552971298	12.3952867	215.5134889	162.1104638	278.0534091
1185	(1998 QE2)	55200	2.42754954	0.56776825	12.7877315	345.4614118	250.3204427	38.2834387
1186	(1998 QV3)	55200	2.31556333	0.511364668	14.2534267	33.468946	332.9197512	71.3037799
1187	(1998 QR15)	55200	2.76861543	0.558912257	9.457522	56.9575609	320.2470045	158.3999765
1188	(1998 QB28)	55200	2.0743936	0.379702187	1.0772822	297.9641599	341.6468158	317.5756979
1189	(1998 QH28)	51052	2.63289628	0.557013373	13.0409464	325.6179962	328.7654704	10.0926039
1190	(1998 QK28)	55200	2.33224498	0.580114619	7.884688	204.5493471	174.7205177	57.6690873
1191	(1998 QQ52)	55200	2.10786831	0.456121569	4.8219928	106.2424031	206.0072552	262.7149459
1192	(1998 QR52)	55200	1.04387684	0.287990253	17.6372123	204.2266477	316.2802075	57.1594713
1193	(1998 QA62)	51059	2.06593571	0.746119424	24.8948045	273.1298754	181.6165838	341.6784052
1194	(1998 QA105)	55200	2.7001958	0.533907536	8.3277287	39.8342184	337.0814305	189.2439858
1195	(1998 RN1)	55200	2.61157078	0.588413285	26.7889857	303.072317	345.4211167	259.7365685
1196	(1998 SO)	55200	0.73137688	0.698610827	30.3532254	359.8237399	176.1700663	209.6999
1197	(1998 SG2)	55200	2.24677065	0.459158589	2.5062162	219.5800005	152.3856161	122.732503
1198	(1998 SH2)	51077	2.70326655	0.718812116	2.4822334	259.9432196	14.273806	14.3652279
1199	(1998 SJ2)	55200	2.33054383	0.500967995	10.3792869	332.7536947	8.8592401	70.0131122
1200	(1998 SS4)	55200	2.27165657	0.512209184	9.6010909	174.5474481	180.8123733	106.1910158
1201	(1998 ST4)	55200	2.81322017	0.599098155	9.3037485	207.0221634	239.3231794	109.6367635
1202	(1998 SU4)	51077	1.15679788	0.585268724	23.4548189	241.7679908	350.8000407	55.2453065
1203	(1998 SV4)	55200	0.81646562	0.642044127	53.3024914	359.4859072	177.259863	273.5647389
1204	(1998 SD9)	55200	0.70268426	0.504593233	2.914268	6.3385515	166.9733454	246.4196005
1205	(1998 SY14)	55200	2.83124743	0.671420127	3.4873539	22.4058946	39.7420253	113.54748
1206	(1998 SZ14)	55200	2.40213527	0.480458613	5.6204272	271.4005622	80.0994067	10.8569806
1207	(1998 SB15)	55200	1.22633117	0.161326196	15.6283216	67.6244798	6.8224144	52.8782731
1208	(1998 SC15)	55200	1.27344965	0.414585183	16.0801956	277.357257	198.7803532	232.0478749
1209	(1998 ST27)	55200	0.81934286	0.53011459	21.0531581	322.4409455	197.5890727	301.3814356
1210	(1998 SZ27)	51081	0.9032239	0.503798487	23.4254613	47.4999289	166.8365485	92.3268034
1211	(1998 SE35)	55200	3.01867285	0.589915675	14.7207707	43.8042994	334.1441466	55.6382687
1212	(1998 SE36)	55200	1.34138887	0.09919611	11.6754281	27.0731473	199.2839002	223.681747
1213	(1998 SL36)	51083	1.39459787	0.419786325	19.1555578	116.5256315	353.2565935	293.562524
1214	(1998 SR49)	55200	2.48045895	0.533338677	29.1662258	54.5148074	21.431239	307.1467963
1215	(1998 SJ70)	55200	2.23492415	0.706373612	7.433216	244.495049	23.6836953	155.9955196
1216	(1998 TT3)	55200	2.3261519	0.500235708	21.6229061	48.6697674	27.4275547	43.2302821
1217	(1998 UR)	51105	1.64437076	0.37672984	17.3078496	311.9448001	28.2301686	20.1149204
1218	(1998 UM1)	51109	1.69525233	0.39981823	4.8464224	0.8733068	3.5335752	10.110708
1219	(1998 UN1)	55200	1.51351556	0.220861208	32.4260586	87.6738925	217.917828	58.5212829
1220	(1998 US18)	51115	2.62357035	0.68057391	9.6617866	115.2338515	207.6111931	11.3054569
1221	(1998 UY24)	51118	1.3640441	0.321300675	16.8876093	275.5564742	38.8678801	48.2455494
1222	(1998 VN)	55200	1.38768922	0.344854758	12.0354247	245.8023667	228.0281042	260.2871149
1223	(1998 VP)	51129	1.87034599	0.458819039	43.8348469	101.2492776	226.4081037	33.2487992
1224	(1998 VS)	55200	1.39969409	0.277411537	6.827103	148.0142059	230.3617357	279.5760735
1225	(1998 VD31)	51134	2.65236124	0.802806246	10.2343595	113.163212	47.9854767	345.371001
1226	(1998 VE31)	55200	1.05076629	0.190183645	21.9429398	219.5084013	57.354539	239.3791215
1227	(1998 VD32)	55200	1.10057417	0.312541233	1.9481302	152.0440158	1.0024321	166.3716003
1228	(1998 VF32)	55200	0.85091439	0.443835576	23.7413326	320.8822094	236.3197636	323.4141187

#	Object	Epoch	a	e	i	w	Node	M
1229	(1998 WY1)	51138	1.61690926	0.357854455	24.6941599	157.912155	238.7074781	10.7067297
1230	(1998 WZ1)	55200	2.16266853	0.556424876	4.3108489	137.2373531	345.0557208	163.5601657
1231	(1998 WA2)	51138	2.70103426	0.598695398	22.3501203	125.89582	234.7574463	13.2672574
1232	(1998 WB2)	55200	1.97998615	0.587830873	2.3878224	78.5762379	52.3832407	336.1576092
1233	(1998 WC2)	55200	2.55366047	0.562189026	26.5667828	270.098331	208.6192231	247.6107061
1234	(1998 WL4)	51137	1.75041407	0.729669062	23.7093142	41.2253461	226.4300783	53.312773
1235	(1998 WR5)	55200	2.57519427	0.515741958	28.225033	118.0726735	256.9352263	258.1011392
1236	(1998 WP7)	51142	1.21257711	0.427163195	21.6307973	64.7324653	230.9767114	67.9253035
1237	(1998 WT7)	55200	1.15184416	0.1099395	40.6975662	235.9223559	248.2940944	315.2574401
1238	(1998 WD31)	51141	2.06960734	0.542415087	1.6820062	60.0686723	70.4775722	338.6469751
1239	(1998 XM2)	55200	1.80489399	0.340432622	27.0925792	99.0044429	248.6228551	235.8542285
1240	(1998 XN2)	55200	1.99934117	0.541783341	1.7774683	126.2284338	255.8373816	343.355653
1241	(1998 XX2)	55200	0.74128282	0.367450157	6.9685017	152.9127461	74.4977731	354.5453978
1242	(1998 XA5)	55200	1.55854373	0.306784366	31.760938	211.2128898	274.2240846	225.0737458
1243	(1998 XD12)	51166	1.39730677	0.62332522	13.5094825	69.269585	259.9848281	38.8354192
1244	(1998 XR16)	55200	2.2734929	0.580212913	20.564558	67.9307912	92.0886789	61.7442453
1245	(1998 XN17)	55200	0.98187086	0.20967244	7.244995	226.3490903	85.9909528	241.1797111
1246	(1998 YM4)	55200	1.4764997	0.71975012	3.4360406	344.4555765	341.837702	89.9636939
1247	(1998 YW5)	51168	1.25271174	0.631437954	8.6239785	354.3587416	220.903965	305.2795258
1248	(1998 YB8)	55200	2.42262641	0.467889227	8.8759413	342.8247247	106.6509785	336.4926042
1249	(1998 YF10)	55200	1.49080641	0.247735415	15.6090817	296.3818939	85.9808628	59.8389805
1250	(1998 YR11)	55200	2.03005637	0.477608638	59.7165777	320.8874119	112.0815705	306.0560277
1251	(1999 AF4)	55200	2.82232802	0.618967908	12.5933114	154.7633956	294.941692	114.5754354
1252	(1999 AM10)	51195	1.7983647	0.512693225	6.7930977	95.1370976	76.9032463	342.9270489
1253	(1999 AO10)	55200	0.91156816	0.110981262	2.6223336	7.6956428	313.3169829	2.0877186
1254	(1999 AU23)	55200	2.15932333	0.410645751	20.4252002	117.8602449	293.6889663	178.92284
1255	(1999 AJ39)	55200	1.15776668	0.276932282	10.0937113	1.5348286	298.5939826	105.7999803
1256	(1999 BO)	55200	2.12026373	0.448855585	19.6583916	131.6838704	293.1924643	213.8603406
1257	(1999 BL33)	51202	2.69325567	0.533635689	10.0233217	0.045085	121.0065194	1.2244902
1258	(1999 CQ2)	51219	1.50320981	0.381040485	3.6976478	137.8941022	318.2490065	19.7730134
1259	(1999 CT8)	55200	1.24956149	0.393788244	44.5075913	40.0185946	337.1628399	1.544249
1260	(1999 CW8)	55200	2.23766775	0.597985729	33.652548	262.0463291	317.1608645	71.1442669
1261	(1999 CG9)	55200	1.06058265	0.062458015	5.1584818	315.559297	138.8409987	33.4586904
1262	(1999 DB2)	55200	3.00298144	0.619311029	11.597123	251.7331565	328.1022593	18.0379139
1263	(1999 DY2)	55200	2.03888281	0.463905038	7.62457	161.2472943	352.2911593	261.9640611
1264	(1999 DJ3)	55200	1.68074002	0.325056061	29.5116525	241.1268994	329.36766	324.6137671
1265	(1999 EO3)	51252	2.65787924	0.601763267	23.7317303	304.3493733	159.9638476	12.6992256
1266	(1999 ED5)	55200	1.74568242	0.466161129	18.180173	273.8983967	5.6674502	204.9094522
1267	(1999 EE5)	55200	1.66918744	0.281583385	31.0025889	192.8432818	355.5259908	354.3158935
1268	(1999 EF5)	55200	2.2290709	0.427201006	31.0621297	178.6368363	6.2776207	86.7060099
1269	(1999 FA)	55200	1.07813292	0.132681117	12.0280706	296.9368805	166.1458958	291.0091329
1270	(1999 FR5)	55200	1.85230556	0.479319573	3.8626235	148.869298	355.8816001	113.4791996
1271	(1999 FQ10)	51259	1.95287316	0.491329431	1.0915327	335.1362115	163.4589325	13.1198745
1272	(1999 FN19)	55200	1.6461948	0.390757041	2.299159	35.7650215	191.1078163	18.6633324
1273	(1999 FP19)	55200	1.94263359	0.519699396	15.0818615	273.961538	347.055644	326.1352666
1274	(1999 FR19)	51262	1.54387164	0.4765625	20.8122545	106.7228335	0.7456996	28.3587553
1275	(1999 FJ21)	55200	1.27449536	0.274501984	21.9643576	67.6139964	19.5140734	252.4301342
1276	(1999 FN53)	55200	1.73525711	0.454976909	20.1621085	191.6166066	50.6506159	232.8308789
1277	(1999 GL4)	55200	2.11884315	0.602812774	7.2512718	293.7613591	178.6061319	198.9497569
1278	(1999 GY5)	55200	1.14625966	0.614441197	24.4433859	232.1393892	203.4558441	320.1575695
1279	(1999 GR6)	51285	1.34965406	0.763639604	29.3141406	146.3934669	181.0450082	327.2138054
1280	(1999 HC1)	51287	2.04072338	0.507766277	1.287268	159.1944376	28.5578623	5.9374579
1281	(1999 HD1)	55200	1.13140477	0.417873919	18.2121673	147.9026869	209.9125057	215.3789685
1282	(1999 HE1)	55200	2.3642246	0.572880893	8.1705542	221.970681	65.9048631	311.6699927
1283	(1999 HV1)	55200	2.56843564	0.539125823	6.4816004	113.7595945	207.1429357	165.6901156
1284	(1999 HW1)	55200	2.3779257	0.456485248	23.7112847	136.3842123	37.9071972	342.6292232
1285	(1999 HX1)	55200	2.55840516	0.566394769	8.2360895	102.2905493	168.0935513	203.3436557
1286	(1999 HA2)	55200	2.79096204	0.698880068	15.0914953	344.2304209	147.375386	122.3266009
1287	(1999 JE1)	55200	1.32329493	0.701977024	20.8921372	302.5997835	53.2012863	317.7766921
1288	(1999 JR6)	55200	1.36660379	0.675139515	20.338493	27.1944251	52.6826085	322.6002121
1289	(1999 JU6)	55200	1.46910644	0.200574624	22.4573303	69.0399737	220.2136357	313.5765385
1290	(1999 JO8)	55200	2.63931968	0.578994768	24.6238404	205.2556873	80.4462587	157.6235288
1291	(1999 JZ10)	55200	1.30612397	0.473226592	25.9200786	79.9640823	54.6021603	88.116759
1292	(1999 KK1)	55200	2.11649699	0.460056962	7.10573	229.9545914	76.832624	129.4326475
1293	(1999 KL1)	51318	1.7190443	0.428322191	9.6578465	116.8434538	64.8023928	21.5564915

#	Object	Epoch	a	e	i	w	Node	M
1294	(1999 LJ1)	55200	1.62151366	0.308538498	4.5597022	351.3075671	243.8661529	53.2220272
1295	(1999 LK1)	55200	0.90720798	0.332643488	11.9064814	223.5887398	240.0612065	215.0507875
1296	(1999 LT1)	55200	2.97964932	0.656417137	42.5724616	158.5573171	67.5440953	22.8301159
1297	(1999 LW1)	51338	1.43916175	0.682866014	6.6743345	168.2776518	204.8493042	324.6014938
1298	(1999 LX1)	51339	1.16526341	0.727140664	19.8254589	133.3578812	251.9938457	320.3794147
1299	(1999 LD6)	51340	1.83977575	0.496039548	11.4352913	71.6940968	237.1728344	344.4180978
1300	(1999 LE6)	55200	1.64321812	0.330124885	27.1412365	185.2729617	92.3544071	356.5046694
1301	(1999 LS7)	55200	1.00980056	0.300733342	13.0602136	123.5969297	252.4245436	63.059642
1302	(1999 LV7)	55200	2.20812474	0.470727536	30.4789144	158.9205636	87.4700279	79.9774794
1303	(1999 LN28)	55200	2.14216636	0.466327562	9.186245	186.5186841	115.69381	120.0507592
1304	(1999 LP28)	55200	1.21934216	0.090824812	16.3114895	307.0095874	87.9991425	169.3606933
1305	(1999 LD30)	55200	2.85262025	0.62292639	8.420285	205.5347885	86.1711781	55.768032
1306	(1999 MN)	55200	0.67388599	0.665247147	2.0150498	9.9050461	80.7804536	213.4744194
1307	(1999 NW2)	55200	1.11704756	0.109201843	8.6773422	52.6771856	289.6384005	273.0946624
1308	(1999 NA5)	55200	1.43577923	0.248088085	4.2747566	318.6912668	262.2581541	79.4879397
1309	(1999 OQ3)	55200	1.89664176	0.42378064	9.1543327	164.3857926	148.0281652	358.6750779
1310	(1999 PJ1)	55200	1.67506511	0.359518596	34.4845335	80.4951878	319.5250526	247.0823978
1311	(1999 PS3)	55200	2.04241498	0.488222618	3.5896975	78.8155971	257.2779473	196.8385358
1312	(1999 RU2)	55200	2.8172122	0.555557068	5.4273205	202.8368604	179.486638	60.2366727
1313	(1999 RV2)	55200	2.43852945	0.508656375	4.797655	44.1455358	334.8045188	247.1735664
1314	(1999 RJ27)	55200	1.47893094	0.352152801	25.7843819	64.2882605	170.3561023	341.5812433
1315	(1999 RN28)	55200	2.16928645	0.454900224	8.77889	342.6291778	346.1339453	88.0638294
1316	(1999 RP28)	55200	1.47573592	0.240342808	9.2356959	144.8701051	174.1946362	289.3553897
1317	(1999 RQ28)	55200	1.90847543	0.423997706	3.5570569	269.7527469	124.2979376	310.1953153
1318	(1999 RZ31)	51433	2.5899869	0.60225733	2.971626	180.0438186	163.3139405	1.415361
1319	(1999 RA32)	55200	1.02641234	0.090250387	10.5197217	9.0534475	167.7725897	134.8124189
1320	(1999 RB32)	55200	2.43270209	0.569583036	3.8783861	40.7199709	329.2365354	254.0709344
1321	(1999 RC32)	55200	1.83893355	0.431502614	30.9664131	82.7779952	352.4087478	17.266057
1322	(1999 RH33)	55200	1.55109947	0.171154655	11.0173641	351.4111878	168.3920534	316.2533055
1323	(1999 RJ33)	55200	1.25473901	0.189228904	18.5272761	27.2270928	343.1799081	107.2041237
1324	(1999 RK33)	51435	2.48342919	0.591399651	2.9666445	51.4516864	321.2616013	355.196903
1325	(1999 RO36)	55200	2.38373213	0.48368052	3.2871041	197.4570808	168.1389184	284.3709872
1326	(1999 RM45)	55200	1.68109332	0.644190864	10.8889882	88.5189433	163.06484	295.2616273
1327	(1999 SO5)	55200	1.08597745	0.065235873	13.3652925	359.7617002	196.1234103	191.462458
1328	(1999 SE10)	55200	3.21097227	0.620314615	6.894487	349.4088759	40.4186749	277.2032955
1329	(1999 SF10)	55200	1.27840293	0.252748763	1.2255807	27.6734052	26.550147	6.5946835
1330	(1999 SG10)	55200	1.45508133	0.613780206	23.5854215	103.2794868	13.5381968	267.3930656
1331	(1999 SH10)	55200	1.09777577	0.129936303	9.5574387	118.8354238	178.630911	29.0430873
1332	(1999 SJ10)	55200	2.13069139	0.712295169	6.8063224	127.9125091	132.6842023	127.0619285
1333	(1999 SK10)	55200	1.76313226	0.441338736	6.9607667	269.1983449	197.8429921	98.2180536
1334	(1999 TX2)	55200	1.28085754	0.463164425	61.3913819	53.5637248	179.9722452	97.6899024
1335	(1999 TY2)	55200	2.27105807	0.60634963	23.072527	230.2439347	192.1199719	348.1083531
1336	(1999 TZ4)	55200	1.5145839	0.157044971	32.0089277	61.5765311	15.1216443	133.9503438
1337	(1999 TA5)	55200	2.39453953	0.489360813	4.2306622	83.9917723	297.4172903	270.8652324
1338	(1999 TB5)	55200	1.96740043	0.393268939	30.4374335	238.6872798	195.6996652	230.7728354
1339	(1999 TC5)	55200	2.01525412	0.547851841	29.0966374	282.6214501	192.5087095	175.753181
1340	(1999 TD5)	55200	2.46354161	0.52996183	4.1556378	309.7990033	105.0711095	222.7524444
1341	(1999 TE5)	55200	2.23887065	0.484937385	6.6093801	355.1288351	12.5343892	23.917256
1342	(1999 TA10)	55200	1.50576237	0.241517407	20.8423742	84.7130311	214.723599	248.9351968
1343	(1999 TK12)	55200	1.68304566	0.393268925	24.4850985	112.0889291	359.1650553	194.2594074
1344	(1999 TM12)	51464	1.59308871	0.465138527	28.669839	250.6567169	199.1335695	334.2127279
1345	(1999 TN12)	55200	1.88660553	0.391196441	37.2607345	150.2076766	212.3926433	357.4629829
1346	(1999 TM13)	51463	2.4711565	0.565889867	2.9393224	191.1867847	190.2812064	359.4752729
1347	(1999 TN13)	55200	2.03160221	0.525892719	9.5143365	216.9097239	202.370146	179.8443866
1348	(1999 TO13)	51466	1.58402217	0.436211011	20.2594129	302.2348112	15.1364833	25.9348387
1349	(1999 TT16)	55200	2.16354285	0.665977264	2.0150194	148.6676822	328.2013672	43.7142621
1350	(1999 TU16)	55200	2.57716522	0.499849282	18.7494818	175.7682729	202.5102382	172.1916772
1351	(1999 TV16)	55200	1.57861401	0.40976117	1.1056114	85.7857599	345.2002203	34.4615204
1352	(1999 TW16)	55200	1.42458828	0.735799687	34.6507205	134.6978404	28.30049	323.1407658
1353	(1999 UQ)	55200	1.09424762	0.016019528	24.8139202	7.1816787	211.3546382	138.1358378
1354	(1999 UR)	55200	1.89820128	0.504071088	3.6013578	17.9758544	50.7689036	313.1663438
1355	(1999 UZ5)	51484	2.57890562	0.793674667	10.3413713	64.6349901	228.6987025	13.2312395
1356	(1999 VT)	55200	2.00387913	0.486217013	14.3641519	297.4262163	38.2653115	231.3471061
1357	(1999 VN6)	55200	1.73316686	0.370529102	19.4853845	43.5429105	58.1247336	136.1195235
1358	(1999 VP6)	55200	1.37867809	0.304689797	12.8156738	108.8050497	227.1968376	131.3308426

#	Object	Epoch	a	e	i	w	Node	M
1359	(1999 VQ6)	55200	2.59492727	0.508546707	27.6285307	254.3220824	203.6163253	137.23598
1360	(1999 VR6)	51489	2.21234678	0.760449474	8.5610572	293.8324172	213.2823177	342.9776174
1361	(1999 VS6)	55200	1.19760953	0.223017804	27.9717102	89.2936088	35.338796	208.2978005
1362	(1999 VM11)	55200	1.59473211	0.278842403	17.051159	206.3138598	218.0697176	0.7735439
1363	(1999 VN11)	51492	2.44159281	0.546234268	31.0626005	32.6509836	44.4344595	351.6333583
1364	(1999 VO11)	55200	2.25160234	0.636442677	15.7958	71.7794352	68.045901	334.804373
1365	(1999 VQ11)	55200	2.8191273	0.591838117	7.9090573	352.931836	26.9119469	56.5842219
1366	(1999 VK12)	51493	2.25441225	0.777438966	9.5351465	102.7226567	48.9582861	345.4268151
1367	(1999 VX15)	55200	2.9987186	0.603136773	12.3656073	268.6208999	222.2034895	311.3867458
1368	(1999 VF22)	55200	1.31336398	0.738524066	3.9080153	271.4033085	3.7478997	305.4475916
1369	(1999 VG22)	55200	1.647066	0.329769715	2.8508802	222.6136607	271.4182861	236.1871732
1370	(1999 VU25)	51496	2.0177187	0.477347611	5.9671544	161.0452529	229.8871611	6.6533672
1371	(1999 VV25)	51498	2.23291124	0.559080188	7.4768331	204.2809291	232.0550731	354.5697155
1372	(1999 VW25)	55200	0.92884263	0.112082721	10.7761599	354.6394505	232.267551	303.0419673
1373	(1999 VX25)	55200	0.90000222	0.139599324	1.6631271	151.7111359	55.300155	166.5767146
1374	(1999 XR35)	55200	2.36919469	0.511469577	18.6986906	81.7929897	60.3664113	243.0192978
1375	(1999 XS35)	55200	17.78462017	0.947454874	19.5168174	333.0219681	48.9793537	49.001699
1376	(1999 XK136)	55200	2.38210439	0.69832108	2.6706132	302.3293437	63.6298111	278.288665
1377	(1999 XL136)	55200	1.81020067	0.647049368	8.9143997	274.1828751	270.9947006	18.2040154
1378	(1999 XM141)	51529	1.23942634	0.370725386	21.6828212	105.5626442	73.1478945	315.2950789
1379	(1999 XN141)	51531	2.51313751	0.618087066	7.3531894	308.0057194	88.538838	10.4852406
1380	(1999 XX262)	55200	1.53282863	0.181887363	8.2307847	102.6106758	334.7333442	122.3186577
1381	(1999 YA)	55200	1.67675477	0.339248629	38.2419676	265.5391449	106.2351448	270.5969397
1382	(1999 YC)	55200	1.42184536	0.830708983	38.1678759	156.3268598	64.852196	299.3280343
1383	(1999 YD)	55200	2.46183539	0.592938564	1.3804622	61.7259291	9.5774329	218.6563209
1384	(1999 YG3)	55200	1.28462666	0.32953885	34.519913	250.2053243	293.3244715	263.5531495
1385	(1999 YR14)	55200	1.65344952	0.400915516	3.7225477	9.4153059	3.1345118	300.1529455
1386	(2000 AA6)	51549	1.29002755	0.521907813	2.05435	287.1780658	280.3758732	317.213202
1387	(2000 AB6)	55200	1.78895926	0.476659214	3.7925612	133.2163111	283.171118	80.5717335
1388	(2000 AC6)	55200	0.85358655	0.286309519	4.6960189	187.9502259	101.7917105	63.4972712
1389	(2000 AD6)	55200	2.21301651	0.42368235	30.057439	335.2293402	112.8644874	22.7816342
1390	(2000 AE6)	55200	2.7183813	0.552785032	11.8888441	279.5789714	119.7637604	109.1495617
1391	(2000 AG6)	55200	1.01765437	0.189861129	2.4348904	276.3587362	283.0882522	199.0322362
1392	(2000 AZ93)	55200	0.74685514	0.359914957	8.5993714	7.9667883	277.5497759	343.1535579
1393	(2000 AD205)	55200	1.69321194	0.585969332	7.9289523	191.9060052	157.2781648	228.059081
1394	(2000 AE205)	55200	1.16430755	0.137468921	4.459171	150.2720166	271.6843658	19.7234389
1395	(2000 AF205)	55200	1.0391082	0.276815834	2.4084305	127.278918	220.1479459	271.6520966
1396	(2000 AG205)	55200	2.29079475	0.52176127	18.4127205	249.0585903	269.939208	293.2093075
1397	(2000 AH205)	51555	1.14609722	0.406969261	2.6033522	117.3223108	248.447792	57.3564424
1398	(2000 BE19)	55200	1.86950907	0.55888763	10.1079211	326.3633316	71.664334	340.7391185
1399	(2000 BG19)	55200	2.66820979	0.556251757	12.5704371	79.2415032	147.9277151	75.0798528
1400	(2000 BH19)	55200	2.02606522	0.45597208	1.3181137	134.6780332	349.4193383	159.6192436
1401	(2000 BK19)	55200	2.4074141	0.580647755	14.7439219	201.0281042	310.5869056	228.8585113
1402	(2000 BL19)	55200	2.72962916	0.639841068	15.1217508	241.2700519	314.8087881	61.2467275
1403	(2000 BO19)	51576	1.20076681	0.384527013	16.8527029	272.1843629	310.2492228	313.2307615
1404	(2000 BO28)	55200	1.69849454	0.599377259	6.3381809	303.0317773	320.0791122	118.0509565
1405	(2000 CL33)	55200	2.47037969	0.553456526	8.8657909	127.7818068	297.9717223	221.0224976
1406	(2000 CM33)	55200	1.32267595	0.272047916	11.5525805	50.1387524	132.9002528	160.3664546
1407	(2000 CN33)	55200	2.59955985	0.586846739	17.6969476	351.5395022	129.6549691	136.0366567
1408	(2000 CO33)	55200	2.32728996	0.568229178	18.2900786	179.2170098	319.5975155	281.4263654
1409	(2000 CE59)	55200	1.13774769	0.166645471	12.2644758	307.5003148	318.737107	309.1638651
1410	(2000 CH59)	55200	0.86328225	0.423202058	3.2720999	109.0362096	214.228064	287.5631008
1411	(2000 CK59)	55200	1.47719176	0.311757306	5.7047461	341.3617494	139.2838838	192.2362998
1412	(2000 CO101)	55200	1.07621534	0.090177108	15.3215645	64.8341959	353.1071153	39.3602194
1413	(2000 CP101)	55200	1.77472975	0.619084108	10.4537791	247.6802299	160.4422353	90.1887267
1414	(2000 CR101)	55200	1.69507894	0.245897489	0.599266	152.9230603	333.7735444	187.2503852
1415	(2000 DN1)	55200	2.8845799	0.669165213	7.7711205	146.1710773	42.3426465	358.6621163
1416	(2000 DO1)	55200	1.43051066	0.681804529	3.4551222	302.5330903	336.0429318	237.6470762
1417	(2000 DH8)	55200	1.83836813	0.305509691	37.6075442	25.2113642	159.2326365	332.1679185
1418	(2000 DK8)	55200	2.52722205	0.688567764	12.6796459	340.7708219	102.8227646	176.2359467
1419	(2000 DL8)	55200	2.19378769	0.607299051	8.7501724	353.896353	61.9761722	39.078035
1420	(2000 DO8)	55200	2.47560407	0.614478468	0.2851104	97.7356414	93.5478289	182.7691164
1421	(2000 DQ110)	55200	3.35428465	0.630837441	58.3179205	95.5867981	347.8619687	236.9988382
1422	(2000 DV110)	55200	2.09142934	0.387214578	4.396144	220.2867526	11.6683001	50.72306
1423	(2000 EA14)	55200	1.11680397	0.202531773	3.5545283	206.070105	203.9744032	210.6944568

#	Object	Epoch	a	e	i	w	Node	M
1424	(2000 EB14)	55200	0.89549603	0.495419618	11.5626259	139.5856855	162.8845725	131.345385
1425	(2000 EC14)	51608	2.63589983	0.535946922	11.4569955	334.8268467	158.5444726	7.3179803
1426	(2000 ED14)	55200	0.8350825	0.566702274	13.7762433	310.050225	3.9516896	226.6612921
1427	(2000 EJ26)	55200	1.382594	0.61472959	9.2273279	285.7197132	10.6538943	314.1071516
1428	(2000 EK26)	55200	2.40532813	0.659325903	15.6316642	305.386256	126.611648	255.6716646
1429	(2000 EM26)	55200	0.81604869	0.469850454	3.8726414	23.9814894	345.2396159	241.5594576
1430	(2000 EU70)	51614	2.22502619	0.766771336	13.0984783	252.8903837	166.5125407	23.6815813
1431	(2000 EW70)	55200	0.93790195	0.321104272	5.4180553	125.3842239	178.2526404	193.2526287
1432	(2000 EC104)	51618	1.7820568	0.370812549	31.7587185	346.4789006	173.0039679	7.5259613
1433	(2000 EF104)	55200	1.1476296	0.417702879	10.8159515	346.74377	66.4117439	78.363941
1434	(2000 EV106)	55200	1.64886104	0.348541779	33.4759446	255.264024	170.9187351	293.8657571
1435	(2000 EY106)	55200	1.692121	0.455071967	38.1738421	102.6279092	359.8701791	197.7251098
1436	(2000 EZ106)	51624	0.92871575	0.446880141	40.260068	313.9007539	358.5288682	275.640756
1437	(2000 EB107)	55200	3.03283025	0.584401976	25.2707328	43.4546009	177.5100127	296.6485371
1438	(2000 FL1)	55200	2.73370815	0.527877202	43.6467596	7.2571724	78.8868233	97.4236794
1439	(2000 FP10)	55200	1.44006785	0.237605673	23.5788507	165.3579936	5.1278916	242.43892
1440	(2000 FX13)	55200	1.82451882	0.337432412	11.5400991	97.891413	40.5660698	12.6801316
1441	(2000 GB2)	51639	2.44620513	0.59084029	7.0415364	254.6485664	187.7391411	40.5373835
1442	(2000 GF2)	55200	1.34090012	0.37755958	9.6284382	108.0023704	176.1183316	55.7565579
1443	(2000 GT127)	51643	2.43577587	0.473625062	14.52404	206.8716066	17.0932081	351.6318858
1444	(2000 GU127)	55200	2.1070537	0.725057007	8.4200185	138.2354956	172.4904547	41.7694184
1445	(2000 GV127)	55200	2.82354257	0.621966258	17.9371341	2.1118252	197.3339164	18.4545369
1446	(2000 GW127)	51650	2.23572773	0.728964805	6.5340941	331.7898078	127.8616376	18.1546779
1447	(2000 GS146)	55200	1.30448466	0.197112932	46.8503626	80.8190712	33.707512	269.388836
1448	(2000 GC147)	55200	2.77144366	0.615220871	2.3277508	126.8626146	319.0653054	45.0744908
1449	(2000 GD147)	55200	1.89223971	0.550012552	7.1046945	182.159648	357.5105712	268.1995243
1450	(2000 HG147)	55200	1.7899619	0.356610506	28.4832266	99.985565	31.7064805	49.1351559
1451	(2000 GV147)	55200	1.74632571	0.456290439	10.5718662	215.9537788	68.7561398	48.2113834
1452	(2000 HW23)	55200	2.15415579	0.423914367	7.7553587	244.8088954	46.6123592	346.7769301
1453	(2000 HB24)	55200	0.8154666	0.430355235	2.6614414	17.8849939	55.2405013	160.9538888
1454	(2000 HO40)	51662	0.74399955	0.524128684	5.9877829	6.0866893	30.3182921	173.1785522
1455	(2000 HP40)	51669	1.29143894	0.160295544	14.157948	12.6420151	219.0789182	354.9465724
1456	(2000 HD74)	55200	2.926284	0.593774652	49.2375334	223.6858006	55.3039517	322.6543494
1457	(2000 JF1)	55200	2.18491053	0.452603209	11.4044359	220.2887383	55.0300666	337.7550927
1458	(2000 JA3)	55200	2.25521504	0.455637905	10.1775823	151.1609956	119.7654053	291.3880589
1459	(2000 JQ3)	55200	2.45795397	0.489558064	7.8390119	217.4148742	55.2559659	163.0471525
1460	(2000 JE5)	55200	1.23825867	0.400838698	50.7376231	285.1928492	41.2678676	299.242069
1461	(2000 JF5)	51668	2.06125793	0.558140835	13.7544422	216.8824652	58.1307382	347.1514544
1462	(2000 JU5)	55200	1.91165805	0.701018007	9.4749493	50.4914282	60.1881235	264.0508787
1463	(2000 JB6)	55200	1.78622656	0.345280304	10.6394156	175.4970399	110.7050161	343.8820544
1464	(2000 JX8)	51668	1.53389021	0.331583989	5.9804099	188.9330246	41.8998289	356.6388102
1465	(2000 JY8)	55200	2.78295717	0.605173979	16.5355335	41.3247336	109.0762281	53.0882703
1466	(2000 JZ8)	55200	1.47280168	0.231450835	14.169753	12.3143362	213.5448165	148.8697504
1467	(2000 JN10)	55200	2.25782913	0.429830199	21.4469947	254.6218916	47.2374411	275.0897723
1468	(2000 JQ66)	55200	2.16513268	0.420283392	7.0510274	103.564276	189.1807703	345.8309484
1469	(2000 JO78)	55200	2.15097289	0.438160968	7.3377242	349.7238648	310.6169977	346.1874756
1470	(2000 KA)	55200	1.33270186	0.462695344	6.706123	83.0840779	62.6365492	131.47285
1471	(2000 KC)	55200	2.25391106	0.466550464	10.5364367	180.243813	75.1767225	297.3303817
1472	(2000 KL33)	55200	2.11226071	0.430686939	6.9102327	160.2495069	134.1616884	28.0200216
1473	(2000 KE41)	55200	2.99826453	0.86615807	50.345003	56.9487939	64.8998192	317.0236016
1474	(2000 KW43)	55200	1.45232998	0.477839917	24.2778131	63.4715481	82.7483458	217.8226493
1475	(2000 KN44)	55200	2.71596339	0.564212706	26.2793651	97.4855887	75.4997138	67.9861512
1476	(2000 KO44)	55200	1.8300564	0.388627924	28.6341512	235.2102058	114.4280851	261.0842226
1477	(2000 KP44)	51701	1.91188683	0.752419414	28.0582865	134.8975058	227.6539794	335.9140589
1478	(2000 LK)	55200	2.17916197	0.945980506	17.0407365	193.8604767	200.155344	338.8763547
1479	(2000 LD3)	51702	1.43819777	0.740514013	37.1526915	47.1542547	74.2920781	34.1127745
1480	(2000 LF3)	55200	2.57964145	0.659879121	14.9439739	222.651852	83.196428	99.3172439
1481	(2000 LF6)	55200	2.91229745	0.610342142	14.8228034	147.8773882	90.7403639	336.1806884
1482	(2000 LG6)	55200	0.91727689	0.11091348	2.8327308	8.2063284	72.5608749	143.7966977
1483	(2000 LK10)	55200	2.12651105	0.407564539	4.6887513	250.2376966	61.3067567	0.7227743
1484	(2000 NQ11)	55200	2.05389537	0.367435582	7.6255913	220.6140378	104.8020957	65.6228623
1485	(2000 OH)	55200	2.42378207	0.590025699	18.5561427	354.5234424	284.0853906	187.4898648
1486	(2000 OM)	55200	1.70144776	0.640605195	13.5896123	73.751246	123.7315204	125.5132026
1487	(2000 OG8)	55200	2.66809392	0.542175839	5.2864329	70.827489	295.9211357	44.5447582
1488	(2000 OH8)	55200	2.40725162	0.50165364	5.9244894	23.5640519	287.4330453	186.9738732

#	Object	Epoch	a	e	i	w	Node	M
1489	(2000 OK8)	55200	0.98475228	0.221118038	9.9849288	166.1546256	304.6294419	82.3617042
1490	(2000 OB22)	55200	2.76340674	0.53859782	17.5244338	194.3223701	154.9340571	14.3725369
1491	(2000 PN)	51759	1.0196774	0.761263015	22.7803924	37.7189575	128.7920084	54.1576496
1492	(2000 PD3)	55200	1.99847421	0.592745002	7.6886242	109.7837218	299.0059396	87.2614632
1493	(2000 PE3)	55200	2.29537185	0.655848238	17.4650769	274.7710349	316.7330268	273.5220042
1494	(2000 PG3)	55200	2.82665944	0.855553723	21.9660839	141.0426032	323.7417546	323.8833057
1495	(2000 PF5)	55200	3.19754286	0.652928557	6.0594414	52.2535927	298.8522864	221.3857286
1496	(2000 PG5)	55200	2.08618375	0.456848969	6.1113544	358.478456	309.8737069	45.8985391
1497	(2000 PY5)	55200	2.31201198	0.602430763	3.7831828	92.2832415	149.2749875	261.6231551
1498	(2000 PH8)	51763	2.01010573	0.45205487	3.0097954	347.3947224	290.2396378	13.2791829
1499	(2000 PN8)	55200	1.25221511	0.217027636	22.3886979	112.1526327	142.8139849	300.5669061
1500	(2000 PP9)	55200	2.32742365	0.553173827	5.5935128	159.5049164	171.7649839	230.9502269
1501	(2000 PQ9)	55200	1.90385635	0.432044472	13.4845019	6.7533873	297.2995158	216.141384
1502	(2000 PQ27)	55200	2.22801935	0.420572987	7.2933317	44.1980378	321.309055	280.4896658
1503	(2000 PO30)	55200	1.835953	0.399679937	3.5786449	217.8283885	201.1290254	269.5118676
1504	(2000 QS7)	55200	2.68262718	0.662163167	3.1934203	218.7346767	153.4742462	39.412863
1505	(2000 QT7)	55200	2.30122192	0.497528223	12.2757951	15.2977983	329.1804799	241.7415273
1506	(2000 QU7)	55200	2.27913002	0.648972436	22.3277976	87.329206	339.6036376	238.6113913
1507	(2000 QV7)	55200	1.40863759	0.522867914	9.1253078	79.3510961	154.8996038	254.8417851
1508	(2000 QW7)	55200	1.94659179	0.467950876	4.1631274	190.6215706	158.725855	155.2217639
1509	(2000 QX69)	55200	1.01047385	0.271495397	4.5822214	73.6272053	150.5159992	156.1373484
1510	(2000 QY69)	55200	1.426528	0.163671251	25.2052975	64.9951858	342.0237128	123.2615018
1511	(2000 QJ130)	55200	2.48572918	0.49586984	7.4766433	187.5061541	162.4253456	134.4348036
1512	(2000 QL130)	55200	2.58616758	0.534709154	8.8028721	147.2892766	165.7581371	93.9875235
1513	(2000 QN130)	55200	2.89870054	0.570107335	2.5609371	300.1069698	104.3105	309.4589385
1514	(2000 QO130)	55200	2.24911514	0.455704689	5.9008453	339.5226739	343.2644387	282.8676343
1515	(2000 RS11)	55200	1.28132889	0.321016749	17.0924405	301.7538725	172.2422999	73.2010607
1516	(2000 RJ12)	55200	2.15210507	0.482428472	7.1500387	25.6972348	318.0958581	343.0297212
1517	(2000 RK12)	51791	2.51628624	0.687800867	31.9517373	250.8946686	162.242017	347.4611975
1518	(2000 RM12)	55200	2.4310844	0.667850417	57.2704632	102.0750908	354.4837808	142.6348212
1519	(2000 RN12)	55200	2.2879318	0.617192486	16.8799808	80.4007746	337.7556241	229.0091436
1520	(2000 RD34)	55200	1.96350566	0.346844353	6.9304053	132.0317821	309.0959686	90.4230182
1521	(2000 RV37)	55200	1.04086744	0.496016005	16.3370672	210.8771196	330.4020928	62.0166562
1522	(2000 RD52)	55200	2.20328608	0.444056137	4.9451888	24.4153505	309.140054	308.4929154
1523	(2000 RE52)	51798	1.15129462	0.245313752	18.3214132	257.8811274	344.282947	76.7138525
1524	(2000 RF52)	55200	2.33483239	0.545362638	5.0487826	6.904366	344.8307444	220.0047523
1525	(2000 RD53)	55200	1.78680465	0.427956128	9.2815312	192.6566058	176.0226512	316.1812403
1526	(2000 RH60)	55200	0.82590931	0.551394285	19.6460833	354.3716046	177.9129903	325.3899378
1527	(2000 RJ60)	55200	1.83173189	0.324557426	35.3221328	67.7448557	324.4275133	249.5082772
1528	(2000 RK60)	55200	2.17761675	0.488248461	6.5879971	133.4486186	197.2012238	329.2096707
1529	(2000 RN77)	55200	0.95096854	0.318329829	16.0954368	211.7224626	312.8400093	207.9516489
1530	(2000 SL)	55200	1.54014865	0.394494183	38.3569069	70.1929417	207.7990387	345.1366563
1531	(2000 SB8)	55200	2.27734276	0.480526913	8.7800849	311.9932824	43.0004986	255.0495954
1532	(2000 SD8)	55200	1.12928819	0.313749591	6.5528325	211.4615676	19.225488	359.0263382
1533	(2000 SE8)	55200	2.48796093	0.595310082	0.6508358	234.6243845	98.929907	137.2094695
1534	(2000 SF8)	55200	1.64935383	0.345313644	17.4417704	339.6929427	351.3057376	149.0913612
1535	(2000 SG8)	55200	2.46492365	0.901088747	24.1359056	151.9894469	338.2264199	125.5247173
1536	(2000 SH8)	55200	1.68841705	0.489176825	56.3801333	86.3122795	1.911001	47.5544183
1537	(2000 SJ8)	55200	2.66485938	0.552941623	7.123615	112.2772153	229.9106626	50.4082364
1538	(2000 SL10)	55200	1.3723104	0.338716498	1.4631495	78.4462676	208.8463812	316.6906585
1539	(2000 SM10)	55200	1.66251206	0.539732149	0.5478369	176.6361571	260.6613482	94.2497802
1540	(2000 SN10)	55200	2.49541515	0.549635317	11.7616911	353.2554654	353.4577092	131.5861415
1541	(2000 SO10)	55200	1.29950061	0.540204234	36.9827051	203.9444018	356.46926	227.2937247
1542	(2000 ST20)	55200	1.87458231	0.310333368	16.8472488	72.4791056	343.4114089	191.8598599
1543	(2000 SU20)	55200	3.19498438	0.628323084	20.0299089	183.8617574	179.6640418	223.2503192
1544	(2000 SV20)	55200	1.6826986	0.31893143	26.2612376	42.6639275	0.5402621	68.6425192
1545	(2000 SB25)	55200	1.85580655	0.354112725	6.1554805	87.165229	309.4676742	222.5515339
1546	(2000 SP43)	55200	0.81132857	0.46684927	10.3553184	224.3372104	350.6576321	348.4660761
1547	(2000 SR43)	55200	2.5455301	0.549591462	25.9615322	78.7487954	345.7210218	86.0214169
1548	(2000 SS43)	55200	1.73192132	0.409852839	4.0937778	353.1794417	6.8947452	25.9930697
1549	(2000 SZ44)	55200	2.4434118	0.504018173	5.694923	250.5575006	128.845888	151.9561577
1550	(2000 SB45)	51816	1.56454313	0.398777119	3.6693102	216.1847315	195.5854573	341.2485182
1551	(2000 SY162)	55200	2.29415543	0.457073952	7.6638115	187.9709616	213.326597	229.7079085
1552	(2000 SZ162)	55200	0.92988364	0.167703372	0.8932173	131.4111271	14.8022356	355.228264
1553	(2000 SC241)	55200	2.49710829	0.526454689	22.1415907	181.5562954	196.7890788	125.7366048

#	Object	Epoch	a	e	i	w	Node	M
1554	(2000 SG344)	55200	0.97744324	0.066886104	0.1106934	275.1339252	192.1402225	120.2822966
1555	(2000 SJ344)	55200	1.14000234	0.174569254	5.7673452	18.741572	15.0024293	206.7117675
1556	(2000 TH1)	55200	2.30754774	0.542217765	12.13562	335.3207684	12.785804	236.848138
1557	(2000 TJ1)	55200	1.16064307	0.080974512	39.5383834	52.4540757	190.4518213	265.7229143
1558	(2000 TL1)	55200	1.33782754	0.300140052	3.6062097	279.2663717	27.2938141	29.9131326
1559	(2000 TE2)	55200	1.32049815	0.213959914	6.2207742	9.9160995	9.1537392	31.1752793
1560	(2000 TG2)	55200	1.52169809	0.24531493	11.9993671	200.2704164	206.8907132	308.3594746
1561	(2000 TU28)	55200	1.07372611	0.182988029	15.6479475	280.6374245	203.1008974	27.2240221
1562	(2000 TV28)	55200	2.51166769	0.493950894	1.8725231	317.7014815	80.5504504	109.4863797
1563	(2000 UG11)	55200	1.92795772	0.572822265	8.9241344	240.5200319	224.2606411	135.3812664
1564	(2000 UK11)	55200	0.88287602	0.248630624	0.7812406	293.2516524	237.7227031	265.1402764
1565	(2000 UW13)	55200	1.27497375	0.145302808	26.4639624	39.7852474	33.6257117	104.0648643
1566	(2000 UR16)	55200	0.90404596	0.438585384	11.7430857	228.766791	33.8628088	334.1071876
1567	(2000 UO30)	55200	1.80755553	0.450219823	12.610135	30.260268	40.2126487	268.0424924
1568	(2000 UP30)	55200	2.24672674	0.763942738	9.3304145	118.3523553	195.4513438	277.8676825
1569	(2000 UQ30)	55200	1.74715805	0.455100274	4.2643684	37.7025713	60.3012548	329.2422356
1570	(2000 UY33)	55200	1.12413768	0.054422485	26.03606	81.5183547	37.4642108	176.0939671
1571	(2000 VZ44)	51850	2.07611637	0.740332606	5.3205816	128.4545246	8.6997856	342.3740717
1572	(2000 VH61)	55200	2.75623915	0.540811383	9.3249938	252.8939973	207.5773895	329.5372729
1573	(2000 WC1)	55200	0.87950582	0.262725277	17.4117748	230.004891	50.8541377	135.8512235
1574	(2000 WG10)	55200	1.16421523	0.205824359	6.2976537	74.2247324	49.3604989	48.474594
1575	(2000 WH10)	51870	2.52174784	0.661436289	13.2658007	63.2588853	50.3512676	350.3610606
1576	(2000 WJ10)	55200	2.06932799	0.458404771	16.0717719	42.0905035	59.235386	6.2499374
1577	(2000 WK10)	55200	1.47833716	0.701916444	14.7504769	244.3031741	58.1587611	71.0354471
1578	(2000 WL10)	55200	3.14685846	0.716433378	10.2264201	115.0463048	252.2008519	231.9600321
1579	(2000 WM10)	55200	2.28383794	0.553674717	0.7089085	330.918381	97.3636267	227.6740739
1580	(2000 WP19)	55200	0.85431133	0.288613607	7.6811563	222.0805178	55.8051247	309.6448588
1581	(2000 WQ19)	55200	1.40597237	0.346885534	34.275072	270.6985441	38.8509663	221.229184
1582	(2000 WS28)	51870	2.06231815	0.565121611	7.746438	49.8493289	57.7250723	348.4526669
1583	(2000 WT28)	55200	2.55183986	0.610503695	5.6556298	19.7891584	47.094938	79.9598662
1584	(2000 WX28)	55200	2.85361984	0.594386722	5.4362841	250.7815669	174.092688	324.8847141
1585	(2000 WY28)	55200	1.63849938	0.28954713	19.4480413	357.3065594	63.3539376	120.8079146
1586	(2000 WG63)	55200	1.9088403	0.474039754	9.185365	185.6341382	243.4280438	160.053185
1587	(2000 WH63)	55200	2.36785299	0.53410101	11.8762117	164.3707854	234.2657981	184.5858123
1588	(2000 WJ63)	55200	2.84365219	0.588828089	2.7697673	315.2757091	115.2516503	327.424492
1589	(2000 WL63)	55200	1.43167072	0.298705968	18.2768148	71.6850882	79.4802339	61.1965479
1590	(2000 WM63)	55200	1.02976283	0.156549807	20.1362484	214.5348746	74.5483861	26.0040986
1591	(2000 WC67)	55200	2.69179437	0.573602064	10.000825	249.3238973	251.8116319	2.797664
1592	(2000 WS67)	55200	1.29865307	0.707128724	20.6554451	198.2980929	73.8255007	134.8690488
1593	(2000 WJ107)	55200	1.94809598	0.557415967	5.9824722	127.2451873	237.9648644	141.5217769
1594	(2000 WK107)	55200	2.59327232	0.541245249	24.1645195	272.0015253	233.7695276	31.3152537
1595	(2000 WL107)	55200	2.922747	0.647193884	4.8645958	184.2152182	251.3522223	299.0487849
1596	(2000 WM107)	55200	2.54263935	0.607311128	19.348372	281.0125803	71.6375626	109.2574368
1597	(2000 WN148)	55200	1.26607193	0.17380329	12.4283918	177.4807069	248.8719951	137.6884889
1598	(2000 WO148)	55200	1.64164609	0.376611427	4.4203821	323.6933674	150.2365703	90.2220365
1599	(2000 WP148)	55200	1.31835364	0.264150091	21.2783408	237.9001936	252.0521806	138.5777584
1600	(2000 WQ148)	51883	2.03142413	0.592227469	1.8788596	276.1233911	224.1283218	343.7006647
1601	(2000 XF44)	55200	2.54420912	0.564596251	13.2814256	176.4985618	245.3611694	85.421665
1602	(2000 XJ44)	55200	2.13325145	0.706315366	10.6327501	52.2154324	286.9486192	347.6244577
1603	(2000 XH47)	55200	1.52579359	0.225190096	16.945061	104.5943305	295.9185405	316.2246202
1604	(2000 YA)	55200	2.38197837	0.649460372	2.7773451	58.3532701	85.5516042	158.1897643
1605	(2000 YG4)	55200	2.2130313	0.502619689	2.5727172	244.4242918	263.1954155	249.8911479
1606	(2000 YH4)	55200	1.48940745	0.458688451	17.9713355	269.3548973	85.6740003	25.2926258
1607	(2000 YK4)	55200	1.6665226	0.372923773	26.0732117	233.9379621	281.6481316	43.7289256
1608	(2000 YF29)	55200	1.4913907	0.371490184	6.3002467	27.8942285	124.9057574	314.6942673
1609	(2000 YG29)	55200	3.17597825	0.692459822	18.8740111	358.4534146	92.4428422	217.6099646
1610	(2000 YH29)	55200	2.21745529	0.528392589	21.8417548	284.7319071	103.8457228	281.8467039
1611	(2000 YJ29)	55200	1.95785223	0.833064315	43.6417316	327.7511006	266.2040801	80.4029516
1612	(2000 YO29)	55200	1.81479664	0.694489883	54.560321	309.3119773	262.7157382	210.0574938
1613	(2000 YS134)	55200	0.85713668	0.224879106	3.4911087	189.4310672	97.3572565	297.4735266
1614	(2000 YT134)	55200	1.61991377	0.360958016	40.8612183	87.2018588	299.0089062	174.1945296
1615	(2001 AD2)	55200	1.0394242	0.659826412	1.6547936	111.1073154	211.3069843	253.8327647
1616	(2001 AO2)	55200	3.06409036	0.609205032	19.8617697	77.4727992	104.2128478	224.437396
1617	(2001 AV43)	55200	1.27702455	0.237974982	0.2776573	42.2155971	31.5866727	103.2105053
1618	(2001 BE10)	55200	0.82323579	0.369091053	17.5145157	30.5609693	297.8523544	115.5287052

#	Object	Epoch	a	e	i	w	Node	M
1619	(2001 BF10)	55200	1.61223499	0.440724113	1.4924372	132.98982	37.4594959	115.3815542
1620	(2001 BX15)	55200	1.99391046	0.606782199	12.496443	87.1515027	108.0048717	46.8739749
1621	(2001 BY15)	55200	2.65476503	0.517001258	32.3953148	49.3219177	125.4263201	9.7307894
1622	(2001 BA16)	55200	0.94028461	0.137449441	5.7688719	242.8117084	115.6145488	43.1778256
1623	(2001 BB16)	55200	0.85429763	0.172452986	2.0266843	195.5660223	122.5681364	274.8427343
1624	(2001 BC16)	55200	1.71018388	0.443474465	10.2182653	44.3503765	122.2456641	344.0885233
1625	(2001 BD16)	55200	1.61747266	0.680809268	18.1234649	246.387273	119.7947795	152.9675805
1626	(2001 BE16)	55200	1.25509232	0.403946246	39.3818639	106.1454153	121.9699338	68.6099265
1627	(2001 BZ39)	55200	1.98832355	0.42135645	8.8356194	197.0319852	225.1651937	98.7504918
1628	(2001 BB40)	51934	1.64418273	0.388134757	16.7778358	342.7880048	123.1687488	7.5681121
1629	(2001 BO60)	55200	1.61566744	0.263849114	35.9395838	265.464381	291.3514199	80.1887141
1630	(2001 BM61)	51929	1.37665374	0.185591158	24.916319	329.761743	121.0626092	22.4800129
1631	(2001 BN61)	51929	1.83017163	0.464268734	9.7255041	333.9954455	118.9791039	9.1197882
1632	(2001 BP61)	55200	1.48660897	0.325395232	12.9658019	108.9290669	289.1357138	29.2163965
1633	(2001 CA21)	51943	1.65972433	0.774584731	4.9521411	218.6525948	46.6156086	336.1828609
1634	(2001 CA32)	55200	2.22426351	0.46711687	21.3957364	124.5817129	353.4335221	254.964547
1635	(2001 CC32)	55200	1.64362622	0.347188075	39.982731	251.9421324	318.2877052	41.5121902
1636	(2001 CK32)	55200	0.72551608	0.382464428	8.1320384	234.1358044	109.5189999	288.2548154
1637	(2001 CP36)	55200	0.71468122	0.407201963	10.5545671	353.5374699	330.9831349	82.0113611
1638	(2001 CQ36)	55200	0.93964593	0.176269605	1.2918866	342.46943	31.940968	24.9883853
1639	(2001 CK42)	55200	1.42115998	0.280745528	10.2754309	219.9566671	6.0506644	38.7042651
1640	(2001 DB3)	55200	2.68517252	0.558535037	24.5649187	263.5172502	341.4908893	33.7620013
1641	(2001 DQ8)	55200	1.84184725	0.901551572	12.8943061	14.5985238	342.8610227	226.6088473
1642	(2001 DR8)	55200	1.924953	0.672612092	6.5875364	43.2367929	334.8433812	169.3204149
1643	(2001 DS8)	55200	2.12689139	0.514022412	2.4192794	303.0756711	175.8157623	317.5824977
1644	(2001 DT8)	55200	2.27070035	0.466844173	48.5630662	182.2036573	315.3663025	215.4879062
1645	(2001 DF47)	55200	1.21498364	0.370645918	18.4751865	260.1569642	146.7017431	280.3991054
1646	(2001 DG47)	55200	1.44655072	0.327650852	16.8457744	299.1003501	151.8620358	66.0531686
1647	(2001 DZ76)	55200	2.35502112	0.610156356	5.7593482	38.0282001	152.1340316	154.7773807
1648	(2001 DC77)	55200	2.54393863	0.49998718	9.4045917	195.1356744	356.3161041	56.025537
1649	(2001 EC)	55200	2.57778388	0.772649162	0.591084	107.983079	323.5885852	55.2856552
1650	(2001 EC16)	55200	1.34549766	0.363968578	4.7117529	70.3858932	175.6249083	196.0309082
1651	(2001 EB18)	55200	1.05307393	0.183684947	50.0628414	101.9490178	155.4957362	345.999043
1652	(2001 ED18)	55200	0.9890452	0.05727442	11.6300757	306.6034061	357.8102691	216.6023151
1653	(2001 FZ)	55200	2.42938896	0.572487152	7.125089	60.9326666	158.6653908	107.0208349
1654	(2001 FA1)	55200	1.88314347	0.360135049	33.7960149	326.6379701	175.8179535	158.6864274
1655	(2001 FA7)	55200	2.00681491	0.535941186	22.861021	62.4041756	352.5928407	95.0143523
1656	(2001 FE7)	51990	2.08016917	0.48320114	6.4266469	180.1429594	0.7939626	359.9389168
1657	(2001 FO32)	55200	1.70114975	0.826453945	38.9166561	123.199871	181.9089824	322.2730343
1658	(2001 FP32)	51990	1.35953587	0.333657818	29.2991549	64.6530037	182.6175109	325.4424162
1659	(2001 FZ57)	55200	0.94412885	0.604300237	20.6662141	339.9488449	22.1327844	54.8364909
1660	(2001 FA58)	55200	2.26369299	0.716414333	8.1002513	112.1821157	158.0175306	193.1840775
1661	(2001 FB58)	55200	1.73815078	0.358913994	10.5388288	168.2937364	11.1779546	302.7576282
1662	(2001 FC58)	55200	1.02000591	0.342997272	6.7681818	261.0933915	174.7468627	263.4913584
1663	(2001 FR85)	55200	0.98270651	0.027921789	5.2446337	233.7291189	183.0808079	126.5647543
1664	(2001 FB90)	51993	2.48241733	0.785607496	1.9281021	14.5090391	266.2952575	323.3394566
1665	(2001 FC90)	55200	1.81997944	0.377837918	12.6442476	192.6740696	7.6157167	199.0315131
1666	(2001 FD90)	55200	2.04768157	0.476419247	7.2946658	47.7173657	202.283385	329.9295035
1667	(2001 FE90)	55200	1.93405098	0.495416659	8.7882352	145.0115742	98.597668	79.3387132
1668	(2001 FF90)	55200	2.5896035	0.628035508	23.2817691	291.4217278	354.5058015	4.8608892
1669	(2001 FO127)	55200	0.88867517	0.159154825	7.2897101	200.8047796	189.2255662	328.28308
1670	(2001 FR128)	55200	1.24279401	0.404042544	45.2829384	123.4124496	183.9387046	55.6043923
1671	(2001 GL2)	52011	2.62917611	0.63822964	34.9887737	42.4800806	192.565982	353.0971987
1672	(2001 GM2)	55200	1.67764931	0.485513763	21.1627923	100.3633709	37.5633628	27.691777
1673	(2001 GQ2)	55200	1.00670757	0.168043299	4.6149156	265.4077288	193.5795412	319.0607282
1674	(2001 GP2)	55200	1.03774021	0.073972428	1.2792017	111.2824676	196.869564	355.2897495
1675	(2001 GQ2)	55200	1.2143031	0.503157578	21.8213964	280.2377507	37.2052238	136.0176949
1676	(2001 GR2)	52014	1.85733796	0.62115923	11.7834496	98.7194927	190.8051122	339.579775
1677	(2001 GS2)	55200	1.7796247	0.382503661	18.6870066	148.0761601	24.3362979	257.5361723
1678	(2001 GT2)	55200	2.39791034	0.634649153	3.6657844	358.4754447	146.3627285	140.4008548
1679	(2001 HB)	55200	1.31382573	0.693724739	9.2891629	237.7865941	195.9830134	326.4467237
1680	(2001 HC)	55200	0.87462987	0.499247109	23.7418938	28.1669189	32.6369645	343.8686619
1681	(2001 HA4)	55200	2.68323875	0.795174296	17.2013854	94.8954566	354.7926496	4.4269502
1682	(2001 HW7)	55200	2.17348647	0.510123532	7.7569057	82.2259542	195.9051997	232.2924218
1683	(2001 HX7)	52020	2.26191563	0.507353646	56.7550824	40.6653849	205.4938322	348.7041596

#	Object	Epoch	a	e	i	w	Node	M
1684	(2001 HZ7)	55200	1.46864281	0.498094907	5.4196229	312.6862758	156.4337888	3.5059303
1685	(2001 HA8)	55200	2.38356958	0.530014376	11.5420711	201.8333792	96.0344598	98.3840523
1686	(2001 HW15)	55200	1.52538429	0.252923196	18.9887859	194.7189579	56.5549675	201.3889083
1687	(2001 HJ31)	52026	2.07851022	0.587743552	2.8424575	132.1342523	21.3454825	15.3916533
1688	(2001 HK31)	55200	2.44277578	0.571216181	6.8436501	99.3840195	114.5673707	99.3014285
1689	(2001 HL31)	52031	2.42215901	0.777298357	12.8319616	286.8722503	38.358125	345.6108501
1690	(2001 JV1)	55200	1.7047182	0.435197569	6.6306522	200.9164314	92.3475537	294.3868824
1691	(2001 JW1)	55200	1.17839754	0.068790039	35.3917178	97.458402	62.0630221	339.9083718
1692	(2001 JW2)	55200	1.69770805	0.488587391	9.5825038	87.6731637	247.4372766	281.5095579
1693	(2001 KO2)	55200	2.50799442	0.605700768	11.9693638	326.6889708	243.919783	68.6229999
1694	(2001 KW18)	52050	1.24219984	0.157630866	7.2119582	181.4368937	61.8223335	357.4460323
1695	(2001 KM20)	55200	1.18375366	0.209210263	3.7329844	251.6261872	56.3872627	202.5619366
1696	(2001 KO20)	55200	1.21988101	0.121293531	14.1932151	66.3463039	75.3007816	224.8506564
1697	(2001 KO41)	55200	2.02215684	0.439422448	5.0271945	306.7816813	242.1854997	19.337571
1698	(2001 KF54)	55200	2.3397688	0.650621534	1.6259122	170.8545292	172.551893	115.7616211
1699	(2001 KD55)	55200	3.34793042	0.621513657	9.968918	6.7371312	228.4761522	147.8608875
1700	(2001 KU66)	55200	1.29332505	0.225569364	18.9499809	149.0988347	68.5141187	323.7471573
1701	(2001 KD68)	52065	2.38142727	0.505553826	2.0430069	350.4663862	249.9194734	3.301327
1702	(2001 LB)	55200	1.23599088	0.189272577	20.7883494	118.0141097	80.9578152	125.3792632
1703	(2001 LD)	52067	1.41758489	0.374767773	30.0991673	114.0896856	79.3537854	28.8102047
1704	(2001 LM5)	55200	1.23164066	0.034628697	12.5466245	255.8339739	87.236304	191.983422
1705	(2001 LD6)	55200	2.75299857	0.617490741	9.1630276	248.0858184	72.575952	296.7394844
1706	(2001 MD1)	55200	2.10670494	0.49376306	5.8701736	27.3711631	265.9183029	277.6459136
1707	(2001 MF1)	55200	2.64765189	0.577402137	24.0684503	75.5906864	289.4933943	331.0680722
1708	(2001 MQ3)	55200	2.23257502	0.456303425	5.5863923	24.8735377	313.5810373	178.8511555
1709	(2001 MR3)	55200	2.36405499	0.454357822	4.4445594	58.4282979	221.0481142	122.9364069
1710	(2001 MS3)	55200	2.1341673	0.535634396	4.3953411	319.0929669	273.0994901	276.9689915
1711	(2001 MY7)	55200	2.93551295	0.623964176	20.7949297	207.3848899	95.6322105	245.6578098
1712	(2001 NY1)	55200	2.24963866	0.537607903	11.7040791	357.3032804	282.7899323	188.2188788
1713	(2001 NZ1)	55200	2.01649882	0.404087435	24.6066915	359.7021225	253.9408	359.4754038
1714	(2001 NJ6)	55200	2.17167931	0.41030562	5.0844658	210.9100542	111.1069211	222.3657836
1715	(2001 ND13)	55200	1.50947999	0.436475981	8.4491334	195.0976898	172.0465772	171.335665
1716	(2001 NE13)	55200	2.10798119	0.420139458	7.6973074	162.2416741	130.0258671	272.9757697
1717	(2001 OT)	55200	0.93398278	0.323280564	12.0880065	142.9261165	295.8965803	25.4043407
1718	(2001 OD3)	55200	2.61063782	0.521040234	14.9429113	210.0143913	122.5159313	352.897414
1719	(2001 OE3)	55200	1.61038607	0.335682322	11.9873946	43.8017477	303.0820458	25.9111146
1720	(2001 OV13)	55200	1.98998076	0.449702423	6.3211549	16.4391839	284.554279	3.9906764
1721	(2001 OX13)	55200	2.38280812	0.462337718	4.1829588	277.4518619	54.5131172	96.4717083
1722	(2001 OA14)	55200	1.08912749	0.421493731	29.2382333	144.3520394	309.564141	52.7197988
1723	(2001 OF25)	55200	1.62775715	0.350981299	20.3842111	21.4815878	301.7309572	16.8048447
1724	(2001 OG25)	55200	1.43686185	0.249444692	10.6899533	142.524772	315.7304803	324.8770645
1725	(2001 OC36)	52118	1.41123646	0.480276932	2.3127169	288.6524428	106.3223301	324.0624619
1726	(2001 OE84)	55200	2.28058848	0.471149737	9.3482879	2.6987087	32.2606501	137.5499608
1727	(2001 PJ)	55200	2.10616515	0.499807418	5.7993273	44.6091674	260.9990395	270.8698336
1728	(2001 PD1)	55200	2.23511228	0.457220829	5.9602966	94.5200983	282.5127592	169.890393
1729	(2001 PE1)	55200	2.76099814	0.60112114	3.4711513	190.6954409	183.2077961	282.3044689
1730	(2001 PH9)	55200	2.7134175	0.545998394	5.4698937	64.9066101	288.0339683	304.1843672
1731	(2001 PT9)	55200	1.4689888	0.454907388	7.1972465	261.2616709	330.2580727	301.2197969
1732	(2001 PU9)	55200	2.2454092	0.504321035	29.120868	159.6329045	144.9296509	178.8389529
1733	(2001 PF14)	55200	2.12077693	0.409657611	6.78105	254.0724236	38.4166423	270.6728799
1734	(2001 PG14)	55200	1.47426847	0.335688883	10.7400424	115.3505324	154.7647638	273.7913937
1735	(2001 PJ29)	55200	1.44536602	0.390681063	6.6205933	69.498537	328.5195896	262.6640197
1736	(2001 QJ)	55200	2.34436619	0.464375374	6.9644938	11.0858725	316.2370461	118.5974079
1737	(2001 QB34)	55200	2.20616667	0.417616161	5.7358703	86.2609594	267.0841999	196.4319694
1738	(2001 QC34)	55200	1.12776013	0.187317714	6.2348356	215.1580684	271.8426921	211.4537892
1739	(2001 QD34)	52142	2.13976552	0.513689606	8.2522289	146.8609638	149.1895835	9.7869051
1740	(2001 QE34)	55200	2.15274272	0.73600104	5.46962	312.1903217	281.4037156	255.6625896
1741	(2001 QE71)	55200	1.07770384	0.158475934	3.037194	96.3515146	148.5922717	238.9273227
1742	(2001 QC96)	55200	1.33592123	0.37970629	20.5854438	277.3317121	143.0407796	98.7313162
1743	(2001 QD96)	55200	1.27432088	0.496524235	17.9536072	145.7284213	330.3675314	174.9162336
1744	(2001 QE96)	55200	1.31051678	0.027857665	7.2562583	279.0312848	150.2947451	111.1888549
1745	(2001 QF96)	55200	1.54378335	0.362095097	6.6425833	224.2432103	158.860512	105.0708985
1746	(2001 QG96)	55200	1.70806599	0.268842793	23.4967166	192.5288283	170.5370285	254.3668436
1747	(2001 QJ96)	52147	1.59976349	0.799695477	5.8743152	121.3241391	339.1152952	333.9020454
1748	(2001 QG142)	55200	2.36726579	0.548923648	30.8556253	137.9440699	161.0871668	111.5341582

#	Object	Epoch	a	e	i	w	Node	M
1749	(2001 QH142)	55200	1.52735361	0.221773989	30.6017108	253.3862154	318.3848626	273.2878698
1750	(2001 QJ142)	55200	1.0623183	0.086295928	3.1063094	63.8272464	184.4731705	304.6803234
1751	(2001 QL142)	55200	1.04922583	0.498853119	26.6158503	72.0409309	165.6432085	356.0649404
1752	(2001 QM142)	52147	1.2187773	0.413239491	5.6096828	292.3203542	151.5959996	294.4406211
1753	(2001 QN142)	55200	3.08979658	0.685799724	10.2352107	110.2027814	164.3560521	203.9841327
1754	(2001 QO142)	55200	2.12795792	0.745669344	5.5016578	200.0704902	262.2361002	217.159608
1755	(2001 QP142)	52150	2.40085239	0.567310753	9.7762711	19.9899683	331.2858472	356.8679019
1756	(2001 QA143)	55200	2.26119377	0.491345524	6.8291783	98.1778015	305.6502181	144.193771
1757	(2001 QK153)	55200	2.43748565	0.690629891	7.5817111	2.5943179	260.6673261	83.9426018
1758	(2001 QL153)	55200	2.32813731	0.444141214	22.6126515	235.6232724	162.0417634	111.615686
1759	(2001 QL163)	52151	1.75911798	0.442246592	8.1613584	54.3259732	324.4839199	343.5699634
1760	(2001 QM163)	55200	2.32037832	0.734308701	9.225454	165.8469823	88.0338894	146.3865518
1761	(2001 QP181)	55200	2.24117485	0.526949731	4.5504717	229.0408773	42.7498439	201.7646002
1762	(2001 RO3)	55200	2.49460984	0.595158497	8.6746836	16.0939943	345.2584229	36.4894791
1763	(2001 RP3)	55200	2.34559833	0.558742617	9.2704895	158.6580121	170.6903539	116.500908
1764	(2001 RQ3)	55200	2.40308439	0.472469787	15.5733488	126.5272447	188.7546347	91.3153562
1765	(2001 RE8)	55200	1.53644129	0.233042886	14.0395843	4.5733487	263.8688285	184.7854739
1766	(2001 RX11)	55200	2.77044232	0.54395234	13.0500199	307.6419987	344.00601	302.4025097
1767	(2001 RY11)	55200	1.48302193	0.283313438	22.8473972	71.4595499	295.5730299	199.8142085
1768	(2001 RZ11)	55200	2.19169268	0.507371096	53.1023982	340.4949369	324.0558189	212.7583835
1769	(2001 RB12)	55200	1.05191399	0.381349142	6.6159444	141.6439156	333.2991952	176.8539233
1770	(2001 RC12)	55200	3.22720896	0.639146751	27.312769	185.4008468	208.9444865	153.3466429
1771	(2001 RP17)	55200	2.63779747	0.514158551	8.1602762	60.5854526	353.3792051	314.1308155
1772	(2001 RQ17)	55200	2.00284361	0.492881425	1.3301333	284.3755493	30.8549102	345.4344358
1773	(2001 RU17)	55200	0.95873906	0.240901902	13.8781055	330.3108478	170.7580971	176.385722
1774	(2001 RV17)	55200	0.91415425	0.342488843	7.5235515	4.4009309	154.0642255	30.9657638
1775	(2001 RW17)	55200	2.34646564	0.662039295	8.6654739	93.8533824	161.3174473	136.2102977
1776	(2001 RX17)	55200	2.61377787	0.530678894	10.437609	218.3586551	167.4258933	340.6825945
1777	(2001 RA18)	55200	2.60393411	0.592052437	10.9818285	205.646045	179.7493038	341.5585871
1778	(2001 RB18)	55200	2.3480168	0.542099222	4.1778575	175.0749352	198.3709255	104.806847
1779	(2001 RX47)	55200	2.02099078	0.422960451	10.7450128	23.734484	277.0633778	338.3323967
1780	(2001 RY47)	55200	0.90645249	0.392862359	17.6097407	213.9719031	11.271176	329.121437
1781	(2001 SQ3)	55200	1.11017872	0.254493625	23.8983793	268.111576	356.210874	98.1791386
1782	(2001 SJ9)	55200	2.05290201	0.379439158	20.262474	184.2437243	185.2775331	293.4038074
1783	(2001 SK9)	55200	1.78521858	0.788354978	26.0944773	34.2556572	196.0044267	214.6933258
1784	(2001 SK169)	55200	3.0056852	0.567636876	20.1844926	263.9094905	177.8108634	186.649129
1785	(2001 SY169)	52177	1.22697059	0.408406743	5.0972455	81.9425372	171.7030474	61.5343022
1786	(2001 SZ169)	55200	1.33476112	0.22996128	6.3329298	189.712003	178.7495342	129.2710318
1787	(2001 SA170)	55200	2.11366552	0.506175161	2.6265815	156.7093266	190.1199498	253.2949662
1788	(2001 SB170)	52176	1.36036398	0.463748382	34.5114372	261.3367203	356.7040024	48.4650604
1789	(2001 SC170)	52176	2.25150904	0.535936311	10.8950672	102.1931732	183.1412167	25.2404027
1790	(2001 SD170)	55200	2.2763935	0.526778399	25.261374	215.8428432	197.0616621	137.1428076
1791	(2001 SF262)	55200	1.69128011	0.233884277	43.3480686	9.9604369	347.3182423	265.8751784
1792	(2001 SG262)	55200	1.96294839	0.581692876	4.8163608	99.6446704	359.5297718	339.7674936
1793	(2001 SJ262)	55200	2.9463125	0.575366001	10.8035722	164.9277968	210.4183864	224.286254
1794	(2001 SO263)	55200	2.22960393	0.438519588	6.9000685	164.7299269	177.3359537	181.5644681
1795	(2001 SP263)	52176	2.03530753	0.547656089	1.5246951	226.7603961	178.4736669	348.4497548
1796	(2001 SQ263)	55200	0.94795692	0.49137895	3.9509342	262.3762709	327.2929668	66.4215817
1797	(2001 SR263)	55200	2.25857184	0.430126223	5.0745631	116.8181715	223.2900291	167.169258
1798	(2001 SL264)	55200	2.13615897	0.400702531	5.3215482	280.4829567	38.6868684	252.4562628
1799	(2001 SW269)	55200	1.122338	0.554043758	24.4720767	29.4018424	191.2808195	95.1675507
1800	(2001 SX269)	55200	1.87862848	0.345849986	4.0247078	29.3802429	320.2762664	83.2047954
1801	(2001 SY269)	55200	1.67933533	0.597272931	1.8682579	223.4352192	232.520618	261.930304
1802	(2001 SZ269)	55200	2.36169934	0.664124697	2.4653015	190.4081316	99.19551	117.6896076
1803	(2001 SA270)	55200	1.30229535	0.735298979	38.5412993	15.5562393	210.0548491	237.0818273
1804	(2001 SD270)	52180	2.40744755	0.552465738	24.5118521	42.5669946	4.3046435	349.2223308
1805	(2001 SE270)	55200	1.21522958	0.481650765	5.3695262	107.5661104	357.0694763	17.4178127
1806	(2001 SH276)	55200	1.02822876	0.180585483	20.3952394	54.2654611	195.0190085	85.1587644
1807	(2001 SD286)	52179	2.09607604	0.568610345	6.2576799	130.1871932	182.5816463	12.7155279
1808	(2001 SE286)	55200	2.03637738	0.456055714	26.807445	199.121406	268.585717	271.370962
1809	(2001 SF286)	55200	1.26835172	0.645126344	29.5130625	18.9586983	232.0040656	334.101848
1810	(2001 SG286)	55200	1.35815887	0.347227036	7.7723454	56.1240918	241.2604734	114.3716734
1811	(2001 SS287)	55200	3.24599038	0.674626707	18.4275388	173.845131	230.8388591	144.1081555
1812	(2001 SD348)	55200	1.88494176	0.328342849	14.3861814	89.3511489	202.9268757	110.7184006
1813	(2001 TB)	55200	1.71673722	0.525226044	3.9681458	245.0354616	192.2682283	219.4410663

#	Object	Epoch	a	e	i	w	Node	M
1814	(2001 TC)	55200	2.31168553	0.539540417	17.7404921	310.0240886	14.1265562	137.4758948
1815	(2001 TD)	55200	0.9541492	0.166004553	9.0108829	241.3525421	13.2067938	46.3082007
1816	(2001 TW1)	55200	0.91124317	0.525904472	31.3339082	208.7719665	27.3884587	258.0307996
1817	(2001 TX1)	55200	1.04746493	0.482733636	2.7991895	354.1252655	159.2669812	161.1443623
1818	(2001 TY1)	55200	2.40835132	0.593197072	5.8500969	342.8473205	9.6869756	77.9660036
1819	(2001 TZ1)	55200	2.01064213	0.440158206	39.6021428	149.2641186	189.9326531	331.0899181
1820	(2001 TA2)	52195	1.74962929	0.643264927	3.2369708	226.7477517	50.9982397	27.6369657
1821	(2001 TB2)	55200	1.46055646	0.226416452	25.6947682	351.739515	26.7224204	239.6042851
1822	(2001 TE2)	55200	1.08359747	0.196918771	7.6105847	35.7124797	171.2839981	281.1682055
1823	(2001 TX44)	55200	0.8746809	0.54603041	15.2043082	135.9744542	57.8358415	237.0508443
1824	(2001 TY44)	55200	2.36136626	0.518868647	2.5355946	72.8722133	357.1791589	81.7167649
1825	(2001 TB45)	55200	2.99567697	0.575963399	25.1353109	38.4510421	27.2190405	199.59684
1826	(2001 TC45)	55200	2.21789125	0.642055463	15.5710737	65.9491307	36.1210412	156.540821
1827	(2001 TD45)	55200	0.79670966	0.777360107	25.41148	212.4019347	30.3152835	275.9721562
1828	(2001 TE45)	52200	1.80608814	0.462360806	14.596286	120.1819782	208.8769159	19.8193836
1829	(2001 TO48)	55200	1.8721269	0.540819926	6.8252564	151.7217932	140.5481111	103.5383231
1830	(2001 TP103)	55200	1.80076555	0.359823017	4.7392633	242.9165457	224.3016746	99.529504
1831	(2001 UO)	52199	2.54324155	0.673012601	10.0745355	300.499865	24.0898197	10.2973503
1832	(2001 UP)	55200	0.88391508	0.287197402	7.6981191	133.2515017	25.5559771	208.2442122
1833	(2001 UX4)	52203	1.74511589	0.755866292	8.9612764	333.2003852	182.9204452	335.5190822
1834	(2001 UZ4)	52200	2.89401556	0.552523714	24.0116998	11.5477981	17.8804712	358.0991321
1835	(2001 UB5)	52202	1.74722217	0.356753487	47.4984001	8.1446761	27.302675	357.5940616
1836	(2001 UC5)	52205	2.73217597	0.625769549	30.4181576	23.9713108	28.374026	355.8759302
1837	(2001 UD5)	52206	2.27591384	0.665597947	2.5310814	290.3482828	18.9928044	17.3634672
1838	(2001 UE5)	55200	2.21719893	0.51457414	7.5502959	283.3990721	40.9470717	189.5151054
1839	(2001 UF5)	52203	2.32323279	0.702572773	0.9210135	53.2454385	56.2354563	345.6300317
1840	(2001 UN16)	52215	1.79758257	0.450615041	1.6456097	143.8769817	210.4209158	15.5396434
1841	(2001 UP16)	55200	2.21743644	0.417206133	4.3231014	192.5562189	214.3176744	166.970693
1842	(2001 UQ16)	52205	2.71165341	0.548638708	30.7531827	10.0337629	29.674554	357.8998972
1843	(2001 UT16)	52207	2.1613847	0.530449865	7.0176521	190.3642893	210.9835335	357.4316549
1844	(2001 UU16)	52207	1.7295083	0.415780864	13.3206254	18.8659095	31.5301116	352.9855261
1845	(2001 UV16)	55200	2.18826689	0.503612836	38.0526549	92.3944917	30.8892637	146.3529779
1846	(2001 UW16)	55200	1.36411467	0.178371456	37.5987249	106.6980856	37.0668398	319.7646262
1847	(2001 UZ16)	55200	1.75856898	0.426064891	12.6905238	28.4201986	323.2491079	198.964119
1848	(2001 UW17)	55200	1.55790208	0.232115585	12.9035186	217.8266231	223.2752053	43.6539304
1849	(2001 UD18)	52209	1.80380367	0.441940145	2.7674521	183.4459044	211.9613298	359.423515
1850	(2001 UE18)	52210	1.36128518	0.181786471	15.4517385	60.5932137	32.2694647	318.4534447
1851	(2001 UF18)	55200	1.14116103	0.60941733	31.2762894	202.5296394	46.0195485	330.8817752
1852	(2001 UG18)	55200	2.4119266	0.539551666	8.6154021	124.8671925	235.6089458	76.9717402
1853	(2001 UO27)	55200	2.63209393	0.521175692	40.200667	153.0174223	217.1344095	334.6966047
1854	(2001 UP27)	55200	1.48499187	0.127771396	25.8204849	343.3712735	47.8626492	191.6362019
1855	(2001 UN92)	55200	3.16824437	0.667807441	5.3800529	87.4439143	7.4898981	151.7327306
1856	(2001 UQ163)	52218	2.17149763	0.492016863	6.7681497	261.6144092	56.5277374	34.2850378
1857	(2001 VB)	52221	2.35747579	0.898265719	9.5010313	224.6220585	305.767818	349.8656906
1858	(2001 VB2)	55200	1.71805541	0.395546558	7.9368268	319.606502	50.1274243	232.5465082
1859	(2001 VC2)	55200	1.0408083	0.132050469	12.5108927	103.8534378	67.1558774	128.3467788
1860	(2001 VD2)	55200	2.41922312	0.579153241	5.9931083	195.160996	226.5049051	58.2070258
1861	(2001 VE2)	55200	1.10578851	0.181013143	4.3903362	73.8680296	47.1273899	307.539853
1862	(2001 VF2)	55200	1.81787527	0.384702213	8.9114845	11.6733121	58.8914287	109.6757161
1863	(2001 VH5)	55200	1.27392771	0.186699943	26.5168685	119.3518379	230.4425151	280.3402291
1864	(2001 VJ5)	55200	1.93519556	0.561252608	6.0704321	67.4844856	44.8832974	353.0463182
1865	(2001 VK5)	55200	1.26925462	0.514187243	19.4337322	263.8567046	54.3171463	302.1395065
1866	(2001 VM5)	52226	2.42425071	0.587741437	5.862544	168.5980852	231.7485413	2.43647
1867	(2001 VG16)	55200	1.75503713	0.431496572	11.6507825	14.2658455	48.501825	173.9886146
1868	(2001 VF75)	52228	2.06120861	0.55171056	19.218779	74.1084572	48.1542338	339.6334731
1869	(2001 VJ75)	55200	2.67626544	0.601407998	17.1737228	353.3973241	58.0628792	313.0920579
1870	(2001 VB76)	55200	1.4589094	0.348373508	4.2376962	248.3002039	259.560038	166.5509412
1871	(2001 VC76)	55200	1.75475252	0.442064877	16.8481147	258.7361351	52.3307686	230.265218
1872	(2001 VE76)	52230	1.74321737	0.51459625	4.1707279	262.223601	217.5378209	339.4682092
1873	(2001 WH1)	55200	2.46847944	0.800494463	15.5815265	107.2849656	68.3307322	17.4454547
1874	(2001 WN1)	55200	1.50177612	0.303128417	14.0662574	127.2140479	243.7481001	182.0873951
1875	(2001 WS1)	55200	2.59897903	0.612290567	13.2484078	4.4056355	1.5787369	343.6574909
1876	(2001 WT1)	55200	1.08935178	0.3971607	7.1521673	180.537713	73.9666562	200.8470746
1877	(2001 WV1)	52233	1.40277914	0.452601421	1.5032429	287.7936365	207.1521954	327.1867468
1878	(2001 WW1)	55200	1.21018245	0.121794713	21.7406074	45.6685378	59.8527367	357.0507798

#	Object	Epoch	a	e	i	w	Node	M
1879	(2001 WH2)	55200	2.04237618	0.426040059	15.0351547	16.9121676	80.8519261	269.7972387
1880	(2001 WJ2)	55200	1.44594928	0.244248039	27.330944	297.9387392	57.227592	276.185103
1881	(2001 WJ4)	55200	1.25581052	0.216456396	7.9068187	18.6768819	57.2030098	267.6030723
1882	(2001 WR5)	55200	2.79738324	0.625623775	3.0695896	211.4297203	232.5969384	262.1842427
1883	(2001 WJ15)	55200	1.48400233	0.566463563	8.9466523	87.8510878	239.3167597	206.7705189
1884	(2001 WK15)	55200	1.14098348	0.136932833	24.5086355	99.8975471	66.3918542	153.0845933
1885	(2001 WL15)	55200	1.98915158	0.474459652	6.9408492	14.3737096	112.2290885	303.1229564
1886	(2001 WM15)	52239	1.86171033	0.593020154	5.403645	250.9062846	244.2076087	341.8243456
1887	(2001 WN15)	52240	2.27510448	0.833193998	57.1461733	51.3781139	244.4900129	20.9246252
1888	(2001 WO15)	55200	1.80722679	0.494841483	7.7040048	315.5562034	66.0016862	135.1194021
1889	(2001 WP15)	55200	1.39692821	0.185604928	21.3286949	349.2136196	64.1117637	333.4635817
1890	(2001 WF49)	52242	0.75103189	0.373429601	18.1797656	358.3794963	239.7161327	188.2593359
1891	(2001 WH49)	52238	1.46732513	0.320560269	4.7736494	142.1139608	238.4127357	22.0063786
1892	(2001 XD)	55200	2.04243193	0.797588008	11.4154674	231.9169199	64.7245091	298.0690907
1893	(2001 XP)	52252	1.12877418	0.461752721	30.9814765	126.1222017	68.9766844	288.1812991
1894	(2001 XQ)	55200	3.64234025	0.714641513	28.9877567	190.0950846	251.4180966	56.8899575
1895	(2001 XU)	55200	2.56978042	0.83792805	19.0633028	285.5592495	261.4890161	331.3633865
1896	(2001 XE1)	55200	1.6033838	0.211025598	20.9516283	273.0648428	231.1563772	301.3627997
1897	(2001 XF1)	55200	1.47896001	0.463775713	22.0379771	231.5052383	87.8657894	234.1752383
1898	(2001 XG1)	55200	2.00376469	0.599227334	3.0172652	81.7887551	56.2277187	288.4400844
1899	(2001 XP1)	55200	2.89180963	0.752053036	39.2162537	246.1917196	268.3381354	212.6285286
1900	(2001 XS1)	55200	2.67217783	0.555431271	10.923847	164.7430964	267.039715	309.5482171
1901	(2001 XU4)	55200	1.01938791	0.163468096	12.6826255	69.7641555	259.3694938	32.0204134
1902	(2001 XX4)	55200	1.00658143	0.556812736	0.8472853	186.8690575	127.0101361	55.6594557
1903	(2001 XV10)	55200	2.20639413	0.583929515	22.2834905	341.8018821	31.5276615	202.3569906
1904	(2001 XW10)	55200	2.10369163	0.767701578	4.6591317	353.5496635	340.4823166	250.8939696
1905	(2001 XY10)	55200	0.87176854	0.387231711	30.9944497	219.678881	92.9757506	72.418005
1906	(2001 XH16)	52259	2.10386663	0.627390946	2.6425146	291.1069385	79.3088064	17.0808754
1907	(2001 XU30)	55200	2.19815022	0.664786762	8.8689031	105.7103755	73.1856212	149.9194141
1908	(2001 XP31)	52257	1.14827255	0.387122616	6.1514088	81.6471407	241.4196016	68.9834352
1909	(2001 XQ31)	55200	2.85062823	0.57813486	19.5127613	333.5080389	85.701223	250.9121558
1910	(2001 XO88)	55200	2.50149394	0.60467351	7.163613	317.2761757	85.3815748	23.2205845
1911	(2001 XP88)	55200	1.34691414	0.194378724	6.7479234	261.1590796	97.9036181	121.5222778
1912	(2001 XX103)	55200	2.04974316	0.66674744	6.1706183	85.0056074	79.6285761	250.1038771
1913	(2001 XG105)	55200	1.50254687	0.334594899	21.9649505	42.7843488	83.3822568	110.7476242
1914	(2001 XK105)	55200	2.12924699	0.500729046	7.6334396	7.0035083	79.9539443	211.0941307
1915	(2001 XW266)	55200	2.28719917	0.448998334	4.6165375	89.4423342	206.1846306	150.6878306
1916	(2001 YA1)	55200	2.16083634	0.472920741	27.9836807	167.8920038	255.3208614	195.4300155
1917	(2001 YB1)	55200	1.66435126	0.289919498	26.2755705	181.3152132	262.6084081	267.8094554
1918	(2001 YC1)	52261	1.19387736	0.272866008	20.2442095	252.8096934	263.9036991	315.7684472
1919	(2001 YD1)	52263	1.48913894	0.464925292	7.0408002	285.2011148	85.9442117	30.3112946
1920	(2001 YE1)	55200	1.91203328	0.502309258	4.4580473	97.5493803	65.9210129	349.6218323
1921	(2001 YF1)	55200	1.4863191	0.339430215	20.0116379	289.7890365	279.5483853	80.572914
1922	(2001 YM2)	55200	2.37697439	0.57406215	4.6472618	292.5177226	93.4153781	83.6291673
1923	(2001 YN2)	52265	2.51489735	0.71623368	1.6304436	289.876222	82.6083317	11.9080777
1924	(2001 YO2)	52267	1.2939142	0.688231149	48.0079247	311.4916636	266.2205491	313.5383815
1925	(2001 YP2)	55200	2.00155884	0.480055108	27.9261465	288.4989669	92.8128983	331.3041001
1926	(2001 YO3)	55200	1.33940027	0.165631354	13.1175481	129.5181751	272.8347972	98.8067918
1927	(2001 YP3)	55200	2.49690525	0.620585722	7.9265942	36.3467652	101.9619777	1.4779214
1928	(2001 YR3)	52264	1.69327137	0.377348798	23.4659626	23.2629242	90.0960481	350.8295905
1929	(2001 YT3)	55200	2.37047533	0.465175639	2.7688257	171.0976241	310.7168309	64.3546976
1930	(2001 YU3)	55200	1.94305126	0.464837461	8.5418048	83.0037739	82.5226017	313.2618546
1931	(2001 YV3)	55200	1.94542037	0.71996164	5.2125883	243.8677175	107.6824602	6.4568599
1932	(2001 YE4)	52271	0.6763687	0.542069498	4.8003671	318.3211954	306.0825444	221.2778009
1933	(2001 YK4)	55200	2.64384061	0.78047535	4.6300702	207.8611382	158.0774231	324.5531585
1934	(2001 YM4)	55200	1.72108889	0.38939943	26.21878	96.2198877	290.7719337	236.2008018
1935	(2001 YB5)	55200	2.34914589	0.862241723	5.4914707	114.2547482	109.3144042	67.6818755
1936	(2001 YX11)	55200	1.75238814	0.389548143	5.4662732	301.6159048	216.3891337	141.2917023
1937	(2002 AA)	55200	1.14790815	0.302362689	11.2725194	64.5656022	302.2656793	241.3743567
1938	(2002 AC)	55200	2.25574622	0.647503404	34.6598002	132.0209465	73.1094293	109.4267301
1939	(2002 AV)	55200	2.46610296	0.660676721	2.8415171	285.5101224	124.0732053	34.6158333
1940	(2002 AW)	55200	1.06981155	0.256094193	0.5692144	118.3149325	162.7588486	278.0461649
1941	(2002 AX1)	55200	0.87993041	0.541684921	33.006324	25.3303935	294.7279536	343.9815682
1942	(2002 AY1)	55200	0.77871957	0.437685414	29.8864686	323.8568911	287.8963248	113.7387488
1943	(2002 AZ1)	55200	2.11848653	0.666479833	8.1320454	96.9352338	113.8581095	187.9816731

#	Object	Epoch	a	e	i	w	Node	M
1944	(2002 AA2)	55200	2.256247	0.526865514	35.0898441	7.4294369	107.2493411	125.0875732
1945	(2002 AB2)	55200	0.84084849	0.385897602	13.1822891	149.5473591	103.1398396	16.4962537
1946	(2002 AD2)	55200	1.42321361	0.246672746	32.393451	343.0986159	116.4913087	263.8697417
1947	(2002 AQ2)	55200	2.6639017	0.607549747	11.6564988	159.385911	325.8494286	286.0724537
1948	(2002 AF3)	55200	1.90511614	0.620577374	10.6082901	190.0757349	353.3675974	346.0982156
1949	(2002 AY3)	55200	1.67034996	0.349893393	20.4965264	179.0841843	294.4330521	251.3713051
1950	(2002 AR4)	55200	2.9796504	0.637969085	7.6168211	80.8951635	73.1583817	180.1605405
1951	(2002 AS4)	52283	1.26945066	0.801953324	27.0840338	42.5653589	285.5555482	35.1398089
1952	(2002 AT4)	55200	1.86622901	0.447475033	1.5062232	202.7543366	323.6904996	26.8929916
1953	(2002 AC5)	55200	1.75794284	0.493240488	16.5472316	331.540726	82.4767187	168.8222694
1954	(2002 AT5)	55200	2.67194783	0.541684696	25.7878669	179.756384	332.754083	292.0312629
1955	(2002 AU5)	55200	2.01795892	0.755439326	9.2653047	21.2119071	355.0327786	304.1158471
1956	(2002 AP7)	55200	1.36432276	0.09327408	23.8680206	283.3854813	98.6172389	66.9754157
1957	(2002 AC9)	55200	1.70280383	0.560665444	2.2795399	28.2375698	2.7992239	240.8484473
1958	(2002 AE9)	55200	1.12230716	0.43633407	37.8840189	129.1724522	127.5149449	168.6267564
1959	(2002 AN11)	55200	1.8174157	0.335347397	19.8556297	116.6114253	278.7575702	111.7866941
1960	(2002 AO11)	55200	0.91702646	0.162480136	13.072037	305.9647012	295.1155116	285.9259937
1961	(2002 AW11)	55200	1.44687551	0.330530949	18.3278441	91.0645369	95.6186689	182.7546778
1962	(2002 AK14)	55200	1.01678663	0.105845821	18.0168453	222.2541665	117.4077901	49.1718499
1963	(2002 AL14)	55200	1.03760403	0.12615242	22.9970134	226.1127812	128.5593961	336.0792864
1964	(2002 AT15)	55200	1.89398239	0.475166601	36.3838608	266.4081003	108.541307	53.1678817
1965	(2002 AA29)	55200	0.99308366	0.013077352	10.746189	101.6006052	106.4085292	278.259605
1966	(2002 AC29)	55200	1.64136468	0.503431707	26.58004	129.5275929	85.1993561	210.3387586
1967	(2002 AD29)	52288	1.75783808	0.474436985	31.710179	273.1017723	112.8118736	35.62021
1968	(2002 AE29)	52289	2.38003496	0.611771063	3.5770994	305.4337561	118.8697864	10.6613407
1969	(2002 AF29)	55200	3.25274648	0.612815304	7.9869224	283.0140451	216.8648238	128.2287656
1970	(2002 AH29)	55200	2.40812222	0.562551208	11.417099	35.7951692	118.0334728	37.9707977
1971	(2002 AL31)	55200	1.17690346	0.247643458	7.6125467	247.0408447	297.7908679	41.6844559
1972	(2002 AV31)	55200	1.31106831	0.249776694	14.9785584	267.2276456	119.3788839	177.74012
1973	(2002 AJ69)	52290	1.18045854	0.405573088	25.8899201	226.5012175	116.1292391	90.7852872
1974	(2002 AJ129)	55200	1.37100202	0.914955308	15.5053775	210.8640552	138.1927954	9.2315576
1975	(2002 AN129)	52289	1.81681839	0.524520015	0.2882227	74.4145717	93.9834771	344.2593674
1976	(2002 AR129)	55200	2.85021851	0.577975448	19.4742128	157.3692399	4.2528325	219.9010741
1977	(2002 BG)	55200	1.31835538	0.164165673	23.0543351	33.5579874	115.5169272	67.3593323
1978	(2002 BM)	52295	2.56908334	0.611264261	11.9230841	169.1499104	296.9628298	2.6397452
1979	(2002 BN)	55200	0.87501165	0.546462382	27.7482531	147.2273241	115.7987309	161.3798396
1980	(2002 BA1)	55200	2.06208534	0.456446935	2.6623854	58.0998044	118.8833049	226.7946219
1981	(2002 BJ2)	55200	2.0491819	0.653358955	26.127131	60.8525054	16.6191092	289.4149163
1982	(2002 BM5)	55200	1.54455756	0.298859083	14.6632244	150.9889147	308.9778957	61.1839072
1983	(2002 BF25)	55200	1.07428429	0.22219053	6.2337071	77.4265856	306.0973274	125.0383883
1984	(2002 BG25)	55200	1.23191804	0.233943171	48.824581	239.2548472	316.5744005	244.735359
1985	(2002 BM26)	55200	1.83218619	0.44507574	16.2273477	180.3944759	319.6951891	64.9691273
1986	(2002 BP26)	55200	1.69636054	0.394430944	30.2680987	202.7030547	347.4059082	188.55876
1987	(2002 CM1)	55200	2.29992263	0.461456195	45.0112106	84.154329	308.255015	152.4897991
1988	(2002 CP4)	55200	1.74694732	0.379940458	14.4224275	139.3286462	308.28513	172.8116925
1989	(2002 CY9)	55200	1.64881047	0.508294482	41.9680372	117.3452932	305.3848006	289.7886492
1990	(2002 CR11)	55200	2.49238675	0.589254734	20.7231975	122.6743834	324.9276635	15.3861216
1991	(2002 CS11)	55200	2.01858473	0.404222813	9.8166984	160.3225898	346.3168101	269.5076575
1992	(2002 CV11)	52314	1.55001526	0.393225952	17.0507291	314.1653561	136.6695401	20.2668531
1993	(2002 CW11)	55200	0.86546484	0.225604655	3.1340482	210.3575233	137.6237291	71.1363843
1994	(2002 CC14)	55200	0.81976377	0.403103297	12.6071129	217.9960108	137.6776632	340.0263594
1995	(2002 CD14)	55200	1.77777265	0.578737479	2.8805219	140.9996569	127.8152634	64.9180723
1996	(2002 CN15)	55200	1.32373106	0.695654568	6.1098784	332.0684946	298.6345567	22.5302371
1997	(2002 CB19)	55200	1.28326314	0.451874377	17.1081789	88.6001024	318.1468949	197.0678717
1998	(2002 CA26)	52315	2.37846956	0.664114878	0.5026262	318.636107	118.8749145	11.4802713
1999	(2002 CB26)	52317	1.95336107	0.723139716	6.8201993	264.8958918	140.3590257	17.7590902
2000	(2002 CC26)	52319	2.26316338	0.541789062	5.4565613	206.4831729	325.4692092	353.1954955
2001	(2002 CE26)	55200	2.23338986	0.559329611	47.3129897	228.0115256	161.9634849	203.3968321
2002	(2002 CF26)	55200	1.60440264	0.340971117	35.3167042	33.4846954	342.1393242	72.658385
2003	(2002 CT46)	55200	2.36102488	0.531104078	15.7343758	356.2002378	157.4694885	61.0823968
2004	(2002 CU46)	52321	1.73752604	0.565237232	32.1890642	92.7259245	145.2376163	331.2080555
2005	(2002 CV46)	55200	1.41650652	0.197889748	36.6548497	29.2340114	146.0698429	225.8652581
2006	(2002 CW46)	55200	1.83480897	0.344093677	12.2407311	71.0016132	346.2851252	123.2822521
2007	(2002 CX58)	55200	2.79695945	0.659556745	2.5341638	75.7277644	110.1773261	238.8526576
2008	(2002 CY58)	55200	1.36625371	0.38443742	8.2846257	39.9071109	341.6750832	55.9572059

#	Object	Epoch	a	e	i	w	Node	M
2009	(2002 CZ58)	55200	2.18735419	0.465600011	18.8291336	87.8940324	339.5644628	184.1615486
2010	(2002 CT118)	52317	1.27945273	0.350829909	10.3902384	266.0159604	322.0204217	313.6767804
2011	(2002 DH2)	55200	2.04947278	0.542148919	20.9890372	231.5567203	345.7720348	226.2676878
2012	(2002 DC3)	52337	1.70222166	0.403483506	3.3736286	355.0501849	154.201126	6.2220028
2013	(2002 DO3)	55200	1.86133272	0.49827777	3.8010026	165.4377648	56.2027741	12.3469512
2014	(2002 DQ3)	55200	1.38722647	0.254942111	5.052308	160.2609153	340.6144599	299.7938175
2015	(2002 DU3)	55200	1.14542325	0.238096746	8.7024223	245.5002715	0.7566957	80.450953
2016	(2002 DY3)	55200	1.49174659	0.274587264	24.1661058	137.9299872	354.9990411	119.620194
2017	(2002 DJ5)	55200	1.40048076	0.567704221	6.4397091	296.004166	348.0966158	189.7222356
2018	(2002 EA)	55200	1.37869189	0.423372126	11.2906235	262.820117	342.427653	264.4911928
2019	(2002 EC)	55200	2.15200919	0.519573152	0.927929	160.4092784	349.8137136	178.5129039
2020	(2002 EV)	55200	2.45652621	0.582076068	10.4178323	353.4739208	156.309999	15.7525633
2021	(2002 EW)	55200	1.56347567	0.787778856	6.7360881	24.0885619	15.9493589	27.942838
2022	(2002 EY)	55200	2.13644001	0.63042073	20.2320141	264.8365971	170.8871688	204.2751613
2023	(2002 EY2)	55200	1.72586122	0.48653041	21.7498156	50.9184128	343.5250877	239.3010978
2024	(2002 EZ2)	55200	1.24928086	0.046063562	13.0253312	186.0762333	181.1317231	14.8019491
2025	(2002 EC3)	52346	1.29098844	0.347987602	13.9631519	263.9735724	355.4423586	314.7750939
2026	(2002 EL6)	55200	2.29846043	0.579379767	9.5414864	186.4692808	85.0251113	61.2428098
2027	(2002 EM6)	55200	1.1593619	0.141116631	31.7612216	120.9274486	169.5356572	342.0427071
2028	(2002 EM7)	55200	0.92133314	0.363012534	1.5472177	57.6913397	347.2099435	28.8056696
2029	(2002 EN7)	55200	1.24769198	0.362350551	22.2032472	297.1891694	350.2887317	139.8039053
2030	(2002 EW8)	55200	1.84589181	0.460008821	11.3612023	328.4239191	176.6580569	225.1745705
2031	(2002 EX8)	55200	1.89224587	0.547349088	26.1224949	66.3821775	177.6591128	339.293327
2032	(2002 ES11)	55200	1.81806073	0.401089714	6.1909379	250.8776646	343.6424394	35.494953
2033	(2002 ET11)	55200	2.39759972	0.528936503	10.9178155	81.3858594	160.4820831	11.0019132
2034	(2002 EU11)	52351	2.3965311	0.688471943	2.9433477	274.4427839	346.3362339	345.5925088
2035	(2002 EV11)	55200	2.09635383	0.891039961	11.8025857	217.254516	184.383715	225.1745705
2036	(2002 EW11)	52350	1.51825656	0.428427072	3.7985615	66.5435197	169.9194408	335.0663767
2037	(2002 EX11)	55200	1.88687617	0.410138308	2.5054565	315.0560893	187.1837085	13.2665149
2038	(2002 EY11)	55200	2.21920387	0.47960468	9.8119645	328.9245661	176.4942445	139.184345
2039	(2002 EG116)	55200	1.3975925	0.078233964	12.1970997	50.4749149	158.2263419	230.8140828
2040	(2002 FB)	55200	1.20563618	0.186919987	7.0391631	143.3875708	355.773628	345.5642382
2041	(2002 FC)	55200	2.83152302	0.66066759	6.8015545	194.9793458	50.3957639	214.649177
2042	(2002 FD)	55200	1.42396014	0.28219534	22.8109642	267.1125536	182.2372501	270.7560057
2043	(2002 FW1)	55200	0.82338379	0.342054682	6.5926353	223.1384066	164.142243	277.3631906
2044	(2002 FQ4)	55200	1.52134337	0.194016275	34.9419132	68.4813753	182.4306566	6.8849921
2045	(2002 FP5)	55200	1.74121147	0.299276178	21.5791753	173.7566666	9.4462587	137.7107999
2046	(2002 FQ5)	55200	1.91539682	0.589230862	7.560821	80.4029692	196.5043197	307.2556817
2047	(2002 FT5)	55200	0.96707656	0.30038965	28.0637863	31.4549509	7.983807	189.8817745
2048	(2002 FU5)	55200	2.50486288	0.696882829	4.2064335	156.3899573	111.7567529	331.1969836
2049	(2002 FW5)	55200	1.31491551	0.21777358	46.4469848	85.4283001	21.7722554	123.1007894
2050	(2002 FD6)	55200	1.23301163	0.34185197	10.067049	256.7892951	15.2535295	196.4491041
2051	(2002 FS6)	52356	1.83222974	0.451861814	7.523784	150.1733704	1.44018	10.499784
2052	(2002 FT6)	55200	0.98821625	0.462579694	9.4884135	226.694816	188.5920917	45.8082582
2053	(2002 GA)	55200	2.00247309	0.517222954	12.6541292	112.7051183	47.551434	271.8335956
2054	(2002 GQ)	55200	0.76837229	0.375482547	10.6281182	206.2930038	189.4697254	321.0050405
2055	(2002 GR)	55200	1.20152825	0.20761567	7.3245051	313.7487265	183.832439	356.1263857
2056	(2002 GS)	55200	1.35256381	0.40362895	19.7636428	264.1202599	34.7963	275.1417278
2057	(2002 GF1)	55200	2.06664978	0.403298506	1.8248016	154.5495492	66.7688503	206.7675949
2058	(2002 GG1)	55200	2.32442049	0.56337906	5.8131035	213.7920502	9.1042229	60.6634708
2059	(2002 GJ1)	52369	1.99573702	0.50180063	6.9761523	35.2612634	187.9110914	351.148832
2060	(2002 GK1)	52371	2.53903093	0.625495231	13.6779981	211.6741006	23.0103244	352.8668403
2061	(2002 GM2)	55200	2.19782282	0.808084578	3.3558991	83.8070615	339.8848002	164.0112516
2062	(2002 GM5)	52377	2.12556447	0.695719889	7.3067003	274.0199761	14.0067832	343.1774939
2063	(2002 GN5)	55200	1.6038148	0.290309042	6.1210545	162.8739687	33.1075434	293.1533796
2064	(2002 GO5)	55200	1.89675849	0.766535773	13.8093078	64.8884576	23.0546742	6.6754316
2065	(2002 GP5)	55200	1.77064917	0.302822738	30.9798236	153.323586	28.0360023	111.3749646
2066	(2002 GQ5)	55200	1.15387169	0.478193662	6.2709574	12.910426	63.6418678	158.7991207
2067	(2002 GF8)	55200	2.28317401	0.453794976	4.8877081	237.1492175	20.3651969	67.4935675
2068	(2002 GG8)	52380	2.3056382	0.573240706	12.4040134	326.8630816	201.7699879	8.9126672
2069	(2002 GJ8)	55200	2.96188434	0.828055983	5.3141063	180.3765457	144.1857443	171.9005023
2070	(2002 GK8)	55200	1.84101923	0.401475574	39.0021623	266.7829667	47.8826525	339.8210482
2071	(2002 GZ8)	55200	2.82622307	0.6402923	5.3284571	161.4005521	310.0013724	247.3406188
2072	(2002 GM9)	55200	1.8652294	0.34926569	17.3218267	273.641735	44.2377819	294.5854963
2073	(2002 GD10)	55200	1.21655477	0.130386109	19.2415208	342.9469172	205.8947145	282.9186754

#	Object	Epoch	a	e	i	w	Node	M
2074	(2002 HE8)	55200	1.29223003	0.124249618	24.3929408	187.4838524	33.4823215	73.7805477
2075	(2002 HF8)	55200	2.31539569	0.492361228	4.7797549	260.683008	49.3309892	25.2146592
2076	(2002 HP11)	55200	2.06902501	0.765115267	5.1367226	90.240563	9.4310346	232.8776591
2077	(2002 HU11)	55200	2.67422457	0.555802045	20.5867457	173.9629363	115.560193	256.2132034
2078	(2002 JS2)	55200	2.12738296	0.82621585	11.5509526	320.4708709	123.6509172	187.7007941
2079	(2002 JX8)	55200	0.77019355	0.305253798	4.31542	338.1858925	68.6396189	287.2689616
2080	(2002 JY8)	55200	2.33220352	0.595081357	24.3266977	187.4724282	128.0730367	32.3737328
2081	(2002 JZ8)	55200	2.74260459	0.645762239	9.783074	338.7079717	200.6750317	254.8235898
2082	(2002 JA9)	55200	1.98518024	0.483056982	10.5080651	230.3124236	93.7176282	220.3574206
2083	(2002 JB9)	55200	2.7178933	0.785061965	46.7429411	277.9469347	70.3654567	233.1360311
2084	(2002 JC9)	55200	2.25015183	0.830477809	13.6531248	21.221209	77.3989595	123.9935269
2085	(2002 JD9)	52404	1.05563387	0.440496881	6.6242575	138.8321733	208.4767601	292.4444528
2086	(2002 JE9)	55200	1.06776002	0.416615835	8.828695	255.418064	200.1275908	56.079647
2087	(2002 JQ9)	55200	1.15673578	0.394579046	24.9997612	76.0503366	51.9649407	110.9557666
2088	(2002 JR9)	55200	2.38572635	0.63701851	9.9072942	203.4227709	122.9527705	4.9276806
2089	(2002 JU15)	55200	1.18398249	0.213717439	10.7208558	302.742602	223.2541827	21.6745321
2090	(2002 JW15)	55200	0.89870582	0.266251985	11.76463	175.205523	218.5106024	207.6339892
2091	(2002 JQ97)	55200	2.09055005	0.491024047	0.8170121	14.1039691	253.2336341	180.3431481
2092	(2002 JQ100)	55200	1.1806326	0.518740759	29.6052114	40.076262	47.3631148	72.2377677
2093	(2002 JR100)	55200	0.92464006	0.297738952	3.7633791	253.4618617	203.5481754	322.1397106
2094	(2002 JD109)	55200	2.02016138	0.650052923	24.7448912	186.8354144	143.3032132	214.6179091
2095	(2002 KH3)	55200	2.69346214	0.577096867	10.2406033	34.7982741	259.3480255	251.7079229
2096	(2002 KJ3)	55200	2.26854107	0.488781199	6.4262296	252.0594773	48.1200384	58.2834512
2097	(2002 KK3)	55200	2.45089568	0.565901955	29.1652818	209.051053	65.9917783	341.1251978
2098	(2002 KL3)	55200	1.95126686	0.749317683	20.7313717	293.0658451	73.4670893	251.3469243
2099	(2002 KM3)	55200	1.26569898	0.343619712	9.4284939	92.2717526	236.9068374	76.1097637
2100	(2002 KF4)	55200	2.89539348	0.579240159	37.1409897	193.6311702	77.9689749	182.1788099
2101	(2002 KG4)	55200	2.9314605	0.661753671	27.5892972	149.7486233	64.5226144	190.2275256
2102	(2002 KJ4)	55200	2.26635519	0.559074059	27.8450161	155.2087012	75.6973376	86.545507
2103	(2002 KK8)	55200	1.95670617	0.465654209	24.5167041	174.0547785	77.058836	277.3722001
2104	(2002 LK)	55200	1.10334906	0.148659765	25.0371754	285.682614	248.4720321	258.2194092
2105	(2002 LV)	55200	2.31539762	0.604055269	29.5479983	224.1648604	132.2688441	29.5988574
2106	(2002 LW)	55200	1.01658861	0.101841811	11.173096	126.1077995	250.1537384	35.3898782
2107	(2002 LX)	55200	2.50486791	0.671060201	3.2338512	345.1756301	197.7963311	341.2806435
2108	(2002 LY1)	55200	0.95493876	0.379322766	2.9090576	133.9601498	248.2204436	314.6287778
2109	(2002 LG3)	55200	2.36130668	0.7474238	6.1041261	174.3220481	182.3962625	9.5400258
2110	(2002 LH3)	55200	2.12323238	0.453409645	6.3932544	202.8748623	87.3755114	150.3089069
2111	(2002 LR24)	55200	1.25319732	0.202402532	19.9982546	38.5361396	256.4877564	119.4273681
2112	(2002 LS24)	55200	2.26285228	0.552467054	8.3214672	224.6213241	70.975485	70.0897682
2113	(2002 LT24)	55200	0.71997314	0.495466629	0.7604835	282.0711843	166.7267156	302.9765768
2114	(2002 LE27)	55200	2.18049519	0.452922145	3.0991182	83.3601743	226.4812484	104.8793811
2115	(2002 LD31)	55200	1.46428373	0.256334793	19.5222815	209.8818097	82.7139008	81.6831415
2116	(2002 LE31)	55200	1.99145466	0.543587127	11.4034609	359.7678656	192.8874832	268.837508
2117	(2002 LS32)	55200	1.78309994	0.697364772	8.8271979	151.4775401	239.9679203	31.6170875
2118	(2002 LT38)	55200	0.84481251	0.313820474	6.2016781	162.7341522	259.5303651	108.4701009
2119	(2002 LZ45)	55200	2.31079436	0.634122138	6.1848354	239.7548746	91.3384309	40.1396347
2120	(2002 MN)	55200	1.81547363	0.497578085	1.0470821	131.6511682	85.107826	46.921204
2121	(2002 MX)	52447	2.50446494	0.796130201	1.9610952	237.572937	284.3087585	13.7785798
2122	(2002 MY)	55200	1.33541268	0.211547971	14.7161497	194.8642515	95.1020646	304.7342864
2123	(2002 MT1)	55200	2.37443682	0.497640633	4.7317595	82.4981589	205.6727542	16.1617235
2124	(2002 MR3)	52459	1.50005521	0.618105059	9.7405169	66.9515405	110.5451639	31.1874868
2125	(2002 MS3)	55200	2.39232035	0.611356996	21.8646756	239.3954929	106.2708502	351.7749805
2126	(2002 MT3)	55200	2.80592029	0.689718183	6.5117612	25.2475046	168.4402917	228.7247161
2127	(2002 NV)	55200	2.66694157	0.617118487	22.2723062	271.8049825	294.4169715	284.0202488
2128	(2002 NW)	52464	1.61046686	0.668170439	6.0513767	287.7585359	102.5859618	333.9551882
2129	(2002 NX)	55200	1.74141121	0.433806217	15.0167397	62.2100219	288.5344178	69.1918215
2130	(2002 NP1)	55200	1.24807769	0.165174599	19.1260554	145.139787	315.089623	338.4605822
2131	(2002 NV16)	55200	1.23762758	0.220012968	3.5075242	179.4050097	183.5675537	105.3142287
2132	(2002 NW16)	55200	1.10896614	0.030594945	14.1650375	317.631621	301.605407	190.3775148
2133	(2002 NX18)	55200	2.60182203	0.594541255	3.0128997	221.5378322	164.7854304	253.8612232
2134	(2002 NA31)	55200	1.66606364	0.288509159	19.9763496	219.804483	125.5703761	144.4029491
2135	(2002 NY31)	55200	2.21257769	0.545446269	40.9080935	282.7243454	118.2397233	61.9141328
2136	(2002 NY40)	55200	2.04900539	0.709137668	5.8921426	268.8722996	146.1390545	169.7874181
2137	(2002 OM4)	55200	1.49623691	0.562451059	55.3393783	28.0753898	143.0979448	101.210616
2138	(2002 OS4)	55200	1.92322429	0.453798835	26.8032389	102.0394998	289.5890958	249.3209986

#	Object	Epoch	a	e	i	w	Node	M
2139	(2002 OY21)	55200	1.3551443	0.668998811	13.8888052	314.3776543	119.201744	212.8693266
2140	(2002 OA22)	55200	0.9360874	0.243052123	6.9063925	318.3203785	174.3962689	214.0342798
2141	(2002 PB)	55200	1.07211653	0.343182648	32.9777182	49.3724338	142.8264713	331.8405286
2142	(2002 PN)	55200	1.01465586	0.068806187	9.1438336	107.5191229	309.5133559	357.5069371
2143	(2002 PR1)	55200	2.49127868	0.588488666	6.6441304	207.2953969	148.7415605	306.9706497
2144	(2002 PN6)	55200	2.2699242	0.444225422	5.2788521	89.2385696	257.0524603	49.4600732
2145	(2002 PO6)	55200	2.23466508	0.519217284	20.5893138	301.1382675	304.3231995	102.0862583
2146	(2002 PP6)	55200	2.3250361	0.653651644	20.101347	272.1164976	135.7573809	7.7730514
2147	(2002 PQ6)	55200	2.55861005	0.532305923	8.8733175	213.7470349	145.6367564	277.7885327
2148	(2002 PC11)	55200	2.21951395	0.435904694	4.1558133	142.7181712	227.0315965	67.7983097
2149	(2002 PD11)	55200	2.22300661	0.863572047	12.1010966	150.5407988	296.9885244	63.2105971
2150	(2002 PW39)	55200	2.21089196	0.495986581	8.4665068	238.6972454	121.4343913	75.7209751
2151	(2002 PX39)	52500	2.46191245	0.592694255	1.7991284	140.7498253	135.3784348	9.9820578
2152	(2002 PY39)	55200	2.03866708	0.486353376	5.6293031	50.8628859	321.9985106	177.1812668
2153	(2002 PD43)	55200	2.50896582	0.956047358	26.1672733	210.6782168	315.2788793	324.0596965
2154	(2002 PE43)	52498	2.07352466	0.50398651	7.7785962	8.8430777	318.7274005	357.8834887
2155	(2002 PF43)	55200	1.64397006	0.3661725	13.8614165	191.503017	142.8180458	180.3620925
2156	(2002 PG43)	55200	2.17419773	0.403041666	6.9357532	5.320043	347.0586424	103.5674772
2157	(2002 PO75)	55200	1.76899158	0.380837293	14.2049463	13.9268826	291.0489863	54.0321432
2158	(2002 PG80)	55200	2.01241687	0.437595927	4.4075629	211.5389595	185.8030776	178.8362854
2159	(2002 PH80)	55200	2.16996047	0.458067812	6.4227134	331.2115784	351.3003124	115.0189898
2160	(2002 PC130)	55200	2.3429097	0.482666258	19.506269	80.6686649	312.2242357	353.3352777
2161	(2002 PD130)	55200	1.88129708	0.343832144	8.782675	104.9958473	269.2806555	287.2494838
2162	(2002 PE130)	55200	2.55786676	0.61997818	15.6289942	33.4586361	357.5502095	277.3330761
2163	(2002 QY6)	55200	0.81705541	0.699137439	12.7523667	355.2913141	164.3008565	160.3410118
2164	(2002 QZ6)	55200	1.96632659	0.442489877	22.2225607	359.7213693	323.45336	244.6324958
2165	(2002 QC7)	55200	1.16883023	0.195791778	26.8132315	184.4117293	336.0718242	104.4955857
2166	(2002 QD7)	55200	2.42055861	0.647680311	11.6389712	197.1052321	198.0278968	334.4786239
2167	(2002 QE7)	55200	1.46979395	0.181278423	12.1104458	88.3244166	244.5428119	41.9623836
2168	(2002 QH10)	55200	2.36167816	0.560413776	4.7933707	23.6831408	0.4767027	357.1394179
2169	(2002 QG24)	55200	2.28572219	0.48991559	5.6832419	109.08072	133.0263989	86.350943
2170	(2002 QQ40)	55200	1.21591839	0.565046204	1.7264808	356.3420172	104.2977413	115.9778714
2171	(2002 QG46)	55200	2.43429131	0.627821181	8.3036714	268.259741	345.9563443	353.3187266
2172	(2002 QE47)	55200	1.82882029	0.365590182	0.734762	34.7006489	15.26958	317.3704929
2173	(2002 QW47)	55200	1.97248292	0.516976926	4.2153731	140.7658385	116.4279915	260.1947294
2174	(2002 RB)	55200	2.19569236	0.433854226	7.6408799	194.6919659	125.0582349	100.6961239
2175	(2002 RT)	55200	1.50199608	0.726270918	38.7787815	131.4172505	338.0731785	319.2361452
2176	(2002 RQ25)	55200	1.11145129	0.306193122	4.5684076	225.3116674	10.7827209	174.0933395
2177	(2002 RR25)	55200	0.9670006	0.310054596	13.5403549	156.0754967	349.9439143	109.5728121
2178	(2002 RT25)	55200	1.9329445	0.437606561	28.8851267	258.8889	165.3691062	222.2499075
2179	(2002 RU25)	55200	2.17717078	0.482961821	28.8902322	306.2893009	5.1898356	119.2850489
2180	(2002 RW25)	55200	0.82532784	0.28648168	1.3252077	71.6652564	92.0316789	132.7507019
2181	(2002 RD27)	55200	2.68421497	0.533058959	25.6557961	73.1567864	355.9884266	217.217885
2182	(2002 RO28)	55200	1.50192682	0.331046046	6.1864729	208.927087	163.1016365	339.664927
2183	(2002 RP28)	55200	1.66178449	0.390573951	8.0005173	250.4714749	163.5227387	119.3059996
2184	(2002 RN38)	55200	3.81203089	0.673879482	4.154066	118.1312253	296.6011051	347.2932981
2185	(2002 RH52)	55200	1.97888603	0.492090444	16.1869001	96.6019324	2.3671889	181.390586
2186	(2002 RV112)	55200	2.22066276	0.489109389	16.5072834	199.4230993	196.1107636	72.5405636
2187	(2002 RC117)	55200	2.40996803	0.625992567	2.4813429	222.0177021	169.8638512	335.530622
2188	(2002 RC118)	55200	2.9501296	0.566462204	28.0456277	222.1602464	208.9896691	146.7804118
2189	(2002 RZ125)	55200	1.4139055	0.534181409	28.9673732	56.465942	171.9333494	178.1166349
2190	(2002 RA126)	52531	2.70603278	0.616394048	3.1597215	94.8739965	213.819442	8.0017025
2191	(2002 RB126)	55200	1.42957908	0.722121475	15.0764003	224.7250919	7.0756443	132.318464
2192	(2002 RS129)	55200	1.03129161	0.328966134	8.442832	246.993336	338.9952327	81.9429354
2193	(2002 RT129)	55200	1.83260638	0.753671826	19.6359414	55.6528948	178.7113274	6.5003849
2194	(2002 RO137)	55200	2.15521489	0.451256764	7.0154785	198.0920337	180.0081763	99.5854559
2195	(2002 RP137)	55200	1.16166044	0.082052046	14.1994665	259.0982909	176.3366849	227.0453074
2196	(2002 RA182)	52535	2.15347038	0.416782852	7.5792833	301.4975819	353.6639843	24.8477632
2197	(2002 RB182)	52532	2.54379839	0.650202155	0.2276597	254.3064399	165.5078362	347.4217438
2198	(2002 SF)	55200	2.12509205	0.389632763	4.9414175	222.1649527	136.898658	126.5964007
2199	(2002 SL)	55200	2.20172815	0.499163718	6.5057349	151.9537057	139.2919596	109.3812941
2200	(2002 SN)	55200	1.94866946	0.378213933	6.4253707	337.2303937	36.601652	238.3941983
2201	(2002 SP)	55200	0.90463934	0.600562761	20.8521373	169.3775425	350.9291484	62.2261405
2202	(2002 SQ)	55200	1.42125938	0.382513829	16.8205562	258.8543437	183.7826383	60.0947262
2203	(2002 SR)	55200	1.17972504	0.19606324	6.6889757	285.0816624	160.9420308	184.9896317

#	Object	Epoch	a	e	i	w	Node	M
2204	(2002 SV)	55200	1.40348166	0.236852409	16.7735199	326.8534797	352.7077491	157.6791663
2205	(2002 SZ)	55200	1.29757106	0.433379593	22.8956728	276.4777774	346.9356665	21.1602165
2206	(2002 SQ41)	55200	2.60667528	0.800786924	25.1014835	95.575813	22.1700898	247.2290421
2207	(2002 SS41)	55200	2.10464236	0.382770282	63.6878929	101.8994605	190.142573	183.4148599
2208	(2002 TN30)	55200	2.33526114	0.445681045	19.8509249	91.7133578	20.711818	330.6562143
2209	(2002 TV55)	55200	2.87479582	0.661289596	11.4466586	251.9171149	189.9179762	162.1872714
2210	(2002 TX55)	55200	2.22857753	0.570826449	4.3793439	148.8475937	190.2370585	71.6596361
2211	(2002 TY57)	55200	1.92164864	0.327606681	3.4555371	259.7295728	119.054156	258.7156454
2212	(2002 TZ57)	52552	1.21149918	0.237984833	16.0938979	290.4931596	7.9059849	47.4447737
2213	(2002 TA58)	52552	2.50938519	0.627129751	1.691366	217.8459225	192.091861	352.7785913
2214	(2002 TD58)	55200	2.49523463	0.561621379	14.4835115	167.9158756	194.4848985	301.4189345
2215	(2002 TX59)	52553	1.22329699	0.145778678	12.9778845	132.5908309	188.6179654	37.8978552
2216	(2002 TY59)	55200	1.01902731	0.233665679	6.6108193	259.1342665	9.8389423	92.0748195
2217	(2002 TZ59)	52553	2.59826973	0.841939548	16.4869998	249.7400978	7.3854101	12.1127893
2218	(2002 TA60)	55200	1.15303805	0.521910411	28.216165	233.572095	11.8200695	9.7408446
2219	(2002 TC60)	55200	2.5453289	0.496088793	31.5938551	297.1315598	19.4054679	299.1087235
2220	(2002 TD60)	55200	1.20209518	0.082658507	7.4113854	343.8634504	62.6852653	155.6844878
2221	(2002 TG66)	52556	1.89695731	0.541528391	4.7236891	140.3178525	174.2813848	18.327985
2222	(2002 TZ66)	55200	0.93009421	0.120748383	8.4774535	223.1188211	13.1250129	154.5508999
2223	(2002 TA67)	52557	1.15733556	0.355903644	30.0324827	86.1649672	191.2999147	55.4668714
2224	(2002 TR67)	55200	1.56797887	0.341704948	11.9649821	161.1392226	180.6317832	263.148089
2225	(2002 TS67)	55200	2.34609972	0.491005895	9.6922793	322.765282	79.5086044	358.6113359
2226	(2002 TH68)	55200	1.43538727	0.254246597	19.9394965	334.4957402	12.5761413	91.9334487
2227	(2002 TY68)	55200	2.21749206	0.514054056	20.8065419	58.0384517	19.8908572	42.253832
2228	(2002 TZ68)	52557	2.2147239	0.537151709	3.0441197	2.6645372	13.6415308	0.1500528
2229	(2002 TA69)	55200	2.2773221	0.582159863	38.6815571	48.0002364	28.3361424	27.3624194
2230	(2002 TB69)	55200	2.11113148	0.403190299	37.3831109	335.3473987	37.2899787	137.0215686
2231	(2002 TP69)	55200	1.94558011	0.468881211	1.9672799	316.6513178	94.6730026	226.4849442
2232	(2002 TS69)	55200	1.17597067	0.129924759	8.4529575	195.3970345	200.7162217	228.0411353
2233	(2002 TB70)	55200	1.13333741	0.132118953	16.6545755	350.7846977	195.094229	195.6571286
2234	(2002 TC70)	55200	1.36967122	0.196971386	2.1463578	161.9642497	134.8121801	246.4400056
2235	(2002 TR190)	55200	1.07701313	0.160046602	26.9173131	104.8257096	24.2674752	89.0328926
2236	(2002 UN)	55200	3.00327878	0.610353243	26.2190756	39.8206972	33.5907761	125.1401922
2237	(2002 UX)	55200	1.47344327	0.163464423	20.205669	84.2500112	263.9146551	40.0011918
2238	(2002 UN3)	55200	1.74364589	0.25773696	8.6982821	112.68865	28.0515542	326.9146619
2239	(2002 UR3)	55200	1.3788473	0.793305398	48.5557392	141.1803557	51.9667152	91.2160306
2240	(2002 UK11)	55200	1.32345785	0.575550377	5.3681826	84.350506	69.3361835	210.9023964
2241	(2002 UL11)	55200	2.81085994	0.559018967	9.7483628	331.9673232	52.3700052	187.982459
2242	(2002 UQ12)	52579	1.76396755	0.698673461	2.8814024	309.0171375	191.2482715	337.8429499
2243	(2002 UZ30)	52582	1.27150043	0.458607175	27.5126163	33.4040879	199.8068817	136.4706649
2244	(2002 UA31)	55200	0.79875375	0.487159574	30.7024577	358.6270198	209.3459688	188.7976104
2245	(2002 UV36)	55200	2.45957636	0.597449352	2.8695844	356.064372	32.6535674	310.7533879
2246	(2002 VQ14)	55200	2.58390508	0.510845724	7.2313736	159.0545058	236.4245901	262.4478132
2247	(2002 VR14)	52586	1.62480615	0.498296778	5.5250622	44.0564298	76.430896	332.1931194
2248	(2002 VS14)	55200	1.00905356	0.302027929	23.5448216	226.9164129	42.4468131	132.5864847
2249	(2002 VU17)	52599	2.473904	0.616595712	1.4978466	308.7557922	56.6763169	11.3752128
2250	(2002 VV17)	55200	0.83744779	0.436554278	9.6983608	348.7571037	222.2876883	351.2410625
2251	(2002 VX17)	55200	2.46776948	0.571298371	4.9382945	200.5524468	228.4593481	299.5816412
2252	(2002 VE68)	55200	0.72359724	0.410501603	8.9807548	355.4900684	231.6478757	41.6307345
2253	(2002 VO69)	52590	1.4402438	0.348996643	20.9522612	55.6562318	47.3857401	332.4865134
2254	(2002 VP69)	55200	2.01732482	0.529573651	10.182303	188.6253907	307.0715268	147.5516787
2255	(2002 VO85)	55200	1.32906193	0.222287016	20.129063	248.1465218	230.1735134	195.7857444
2256	(2002 VP85)	55200	1.72193471	0.379689112	37.4304762	38.0839131	62.8529844	36.7189202
2257	(2002 VR85)	55200	1.81633228	0.604035596	6.0102755	298.7283995	204.9561596	302.872927
2258	(2002 VS85)	52592	1.44178441	0.562329752	24.7849416	275.7166306	230.4380861	328.1643475
2259	(2002 VT85)	55200	2.29544706	0.442477068	5.9901154	87.0164531	256.2073501	50.9866438
2260	(2002 VX91)	55200	0.98441375	0.201435913	2.3404902	78.377564	216.6341561	203.5255506
2261	(2002 VY91)	52594	2.32727282	0.581094363	3.4001066	155.5719296	228.4300674	6.710246
2262	(2002 VZ91)	52593	1.57774324	0.385091593	3.4895022	328.7550893	49.0704635	14.8848683
2263	(2002 VC92)	55200	1.46066564	0.278545912	27.3183985	231.7753481	243.6375525	335.2100944
2264	(2002 VR94)	55200	2.38121643	0.558860526	5.5752119	326.862376	57.0647794	343.5660785
2265	(2002 VT94)	55200	3.08154152	0.589701793	25.1612915	174.9441438	247.1365889	109.0494387
2266	(2002 VY94)	55200	3.24166222	0.658145701	9.1513535	233.2004539	280.9446018	47.1577266
2267	(2002 VX99)	55200	2.63432926	0.512539962	24.4479698	259.5976723	234.64434	214.5237773
2268	(2002 VU114)	55200	1.1824416	0.286956977	2.7900693	150.7000725	353.2046749	139.3016287

#	Object	Epoch	a	e	i	w	Node	M
2269	(2002 VD118)	55200	1.42766461	0.143611643	14.2505152	66.3544005	35.2502692	26.9124571
2270	(2002 WP)	55200	1.45006696	0.215790301	19.1494193	1.0732821	76.3610998	10.869676
2271	(2002 WQ)	55200	2.28783711	0.475638201	34.0244451	334.3127542	85.0741168	26.7100549
2272	(2002 WZ2)	55200	2.46083032	0.884326936	51.4153506	48.1136934	261.4433595	315.6980399
2273	(2002 WQ4)	55200	1.96040766	0.555037454	3.9491847	243.873781	267.5279577	179.5624784
2274	(2002 WP11)	55200	2.12585722	0.441410345	5.396302	55.9856338	268.115046	155.5887704
2275	(2002 WX12)	52612	1.74994971	0.659361236	8.6397421	328.211105	211.8313582	332.0682653
2276	(2002 WY12)	55200	1.96994407	0.433298146	20.5935375	5.8819936	62.1258427	197.5790113
2277	(2002 WW17)	55200	3.0295911	0.652852584	18.3766207	90.7370523	72.3383954	103.6582302
2278	(2002 XA)	55200	2.83377214	0.623331265	3.3067829	35.0344611	96.0629146	163.3585355
2279	(2002 XB)	55200	0.90597192	0.237375104	25.5356685	351.216591	245.9164567	278.049453
2280	(2002 XO1)	55200	2.80632225	0.576065106	6.4906155	323.631616	77.220068	187.9393583
2281	(2002 XG4)	55200	2.26524744	0.479952275	21.030228	238.1454731	259.5032706	7.413164
2282	(2002 XH4)	55200	1.60819717	0.270398844	14.5238665	213.5913893	93.5367964	264.9983957
2283	(2002 XT4)	55200	1.60975467	0.422662815	7.5085972	313.1482353	67.3402613	188.8654377
2284	(2002 XU4)	55200	1.33011875	0.141310997	10.7267651	242.0147546	244.6758084	177.7870801
2285	(2002 XW4)	55200	2.41944636	0.501687383	6.9649787	329.8007075	76.2036584	326.4219031
2286	(2002 XX4)	55200	1.78941035	0.283877778	25.6067183	286.9444412	74.1495147	28.770807
2287	(2002 XM14)	52619	1.2859008	0.191409333	62.4542518	129.5316234	254.8905127	37.9955272
2288	(2002 XN14)	55200	1.76756794	0.440610847	11.7858848	310.7598088	86.2614317	24.2636932
2289	(2002 XO14)	55200	2.78713453	0.646090789	2.6187439	184.7918349	295.5611077	181.227855
2290	(2002 XS14)	55200	2.00743882	0.497143125	4.4804379	189.0025715	255.2522308	171.4582134
2291	(2002 XM35)	52610	2.33102801	0.838628667	3.0729775	312.6238502	230.0136021	346.9936259
2292	(2002 XP37)	55200	0.9551905	0.3593612	21.5273255	317.5797284	265.9503847	90.3203519
2293	(2002 XY38)	55200	0.90955588	0.21769552	2.0968076	119.4250603	159.6150531	197.7384394
2294	(2002 XZ38)	55200	2.2163721	0.482039518	21.7064855	236.8680881	263.2182355	31.4061224
2295	(2002 XY39)	55200	1.44790495	0.167025316	21.4429317	213.8480811	252.3052302	0.9410227
2296	(2002 XA40)	55200	2.26324238	0.481617212	4.4532792	66.4605073	300.948881	67.1481788
2297	(2002 XB40)	52620	1.85426537	0.5534626	6.7950087	117.9645557	255.8711443	18.3236871
2298	(2002 XF40)	52619	1.68155264	0.426545069	10.1141056	326.5004844	74.9933067	14.0849285
2299	(2002 XN40)	55200	2.17060361	0.425418246	25.6603691	216.2325357	271.1134903	51.2895867
2300	(2002 XO40)	55200	2.47974059	0.595312449	49.1900643	143.3071264	260.6009981	299.3946507
2301	(2002 XP40)	55200	1.64464231	0.296228051	3.7743418	70.7377609	73.740725	94.6328457
2302	(2002 XQ40)	55200	1.0745433	0.35067762	2.1789163	72.7554871	270.6332202	181.9718108
2303	(2002 XS40)	55200	1.49661829	0.338156255	11.627349	83.6139499	97.739445	244.5785505
2304	(2002 XU66)	55200	2.74985169	0.539674505	24.4498948	89.9123827	285.5709847	212.8978256
2305	(2002 XE84)	52622	2.80906348	0.662837527	28.9150708	53.6672516	74.7766983	353.4751478
2306	(2002 XM90)	55200	1.79057289	0.378395252	20.1818391	80.7093082	81.6821918	304.7257079
2307	(2002 XP90)	55200	2.07969892	0.586995079	23.0947444	324.0721732	78.6709753	141.627293
2308	(2002 XQ90)	55200	2.17152047	0.570673707	3.2384406	115.7289963	282.4799623	85.4271693
2309	(2002 XS90)	55200	0.80956563	0.242042011	34.1585211	178.6274719	81.6952204	70.186092
2310	(2002 XT90)	55200	1.02974739	0.223816948	43.3871415	43.0605603	287.6980669	11.3464907
2311	(2002 XV90)	55200	1.57845258	0.376222359	9.9950242	356.2512563	79.0290159	202.2432477
2312	(2002 XC91)	55200	1.47690793	0.589991596	10.793623	225.5366298	102.5178687	44.6745899
2313	(2002 YN2)	55200	1.24269178	0.586901933	50.2816344	38.4396824	290.7315786	80.9286053
2314	(2002 YO2)	55200	1.5009374	0.294764742	6.4354848	187.6492923	278.766851	227.3982068
2315	(2002 YZ3)	55200	1.94421772	0.795804166	19.9233094	358.7066107	350.1896227	228.737515
2316	(2002 YF4)	55200	1.75474676	0.334314813	33.6735732	93.5425203	61.7565996	337.6643302
2317	(2002 YG4)	55200	1.463582	0.309249135	9.7361266	177.3775347	283.7300826	344.8965183
2318	(2002 YQ5)	55200	1.28683887	0.123560258	15.54535	258.5512957	279.9754131	224.0281391
2319	(2002 YR5)	52641	2.5067712	0.561570673	22.687566	326.1454724	99.0918613	8.6235014
2320	(2002 YB12)	55200	1.68705793	0.551141615	14.0025955	305.7985499	271.2794035	11.3142155
2321	(2002 YC12)	52642	1.71742461	0.439108594	11.4788389	32.785996	99.5069524	349.1028994
2322	(2002 YD12)	55200	2.21926422	0.499625938	14.7248316	193.1085206	276.024726	38.4152268
2323	(2003 AA)	55200	1.72753285	0.279997711	23.4928242	325.6744341	111.9872925	46.2920406
2324	(2003 AC1)	55200	3.14944096	0.651292102	23.4775671	39.3274326	110.5034401	84.8403986
2325	(2003 AD1)	55200	1.81924844	0.323084127	27.1327517	44.7648867	117.5786476	273.7157603
2326	(2003 AY2)	55200	1.82159233	0.564902922	10.3076304	285.5456785	275.3264211	276.5882297
2327	(2003 AZ2)	55200	1.41991362	0.223727097	22.866985	186.8178786	131.6603525	186.9106076
2328	(2003 AA3)	55200	1.42131102	0.289330137	13.780468	346.9559608	106.4505195	50.2984625
2329	(2003 AM4)	55200	2.34443111	0.536858988	7.6425466	309.0810252	115.1620129	355.0818054
2330	(2003 AO4)	55200	2.16553671	0.452008173	21.0803885	112.0853641	306.5329796	90.4958664
2331	(2003 AK18)	55200	0.87627075	0.384193565	7.3886324	23.5995589	301.8106111	300.6898338
2332	(2003 AL18)	55200	1.68442672	0.416348198	15.7385569	246.4201912	313.095842	32.9150834
2333	(2003 AB23)	55200	1.55450876	0.423523748	13.3766712	257.5752009	113.4868214	264.3154216

#	Object	Epoch	a	e	i	w	Node	M
2334	(2003 AC23)	55200	2.16503909	0.584351094	2.0613698	126.3102776	43.7906228	55.1491866
2335	(2003 AD23)	55200	1.64544403	0.76283631	23.3848851	241.3945549	101.7605522	150.5675039
2336	(2003 AF23)	55200	0.87486517	0.426220932	23.2360369	43.9569027	286.8210051	288.7032717
2337	(2003 AS42)	55200	1.50136413	0.341119789	9.9789591	24.1581276	107.4099704	276.3475841
2338	(2003 AJ69)	52652	2.46705639	0.617429009	1.4638759	130.3170733	303.5476218	7.5731917
2339	(2003 AJ73)	55200	1.81130807	0.349999594	9.780445	168.7242647	4.9600645	284.7536169
2340	(2003 AK73)	55200	2.45091676	0.694359414	4.0090009	195.5985518	175.4694607	310.177398
2341	(2003 AL73)	55200	2.54345723	0.693586167	9.6304576	336.3591372	217.4180036	244.7633291
2342	(2003 AA83)	52654	2.49258859	0.783280829	6.8442015	126.3299959	88.6733945	346.217233
2343	(2003 BH)	55200	1.45555744	0.355663419	13.1116799	313.2492717	119.8446526	10.278439
2344	(2003 BL1)	55200	1.71237331	0.319844481	22.4578477	110.6014429	324.1964688	56.5911364
2345	(2003 BN1)	52666	1.53730793	0.487427304	61.0443122	104.4506833	298.8710919	29.6055685
2346	(2003 BO1)	55200	1.32859059	0.080503611	13.696296	2.8174216	140.8515972	178.4919306
2347	(2003 BM4)	55200	1.19871104	0.337286313	9.638883	84.4806333	125.5385593	56.5352665
2348	(2003 BN4)	55200	1.26927767	0.170839911	5.5997782	192.8868892	307.7203132	297.8987938
2349	(2003 BA21)	55200	1.10024612	0.8331626	23.7353803	18.0854368	308.9239796	86.9565775
2350	(2003 BB21)	55200	2.2288613	0.556664843	4.8452376	211.6563852	344.8793809	13.4333772
2351	(2003 BW33)	55200	2.09507769	0.527331447	25.0744441	241.2511793	301.4138501	86.7762485
2352	(2003 BX33)	55200	1.18199585	0.422664319	7.9206322	221.1211922	143.3396923	221.2512315
2353	(2003 BQ35)	55200	1.42496544	0.244912135	8.4849878	223.8416211	137.061544	140.260354
2354	(2003 BS35)	52670	1.25528843	0.206824796	8.4877162	27.1162993	127.4503521	345.3159724
2355	(2003 BT35)	55200	1.39459699	0.171107201	57.270178	41.5661569	122.5921652	40.8273648
2356	(2003 BV35)	52672	1.71635193	0.588457518	30.8082689	95.6948357	311.1873308	24.3596141
2357	(2003 BC44)	52669	2.10461987	0.556557202	7.071869	120.3779283	308.4611706	16.4451483
2358	(2003 BC46)	55200	2.02073463	0.38898105	4.532112	314.2237148	154.0430703	157.6247585
2359	(2003 BK47)	55200	2.74243943	0.708398382	20.7501499	234.9660621	139.1522524	228.1421018
2360	(2003 BR47)	55200	1.62777917	0.499967029	4.4203803	112.4387101	314.6244364	140.2270399
2361	(2003 BS47)	52671	2.10899513	0.522750701	4.8955278	358.1370784	131.6746959	0.6557455
2362	(2003 BT47)	55200	2.33770376	0.490739903	7.5462702	233.9634942	353.5602935	317.8989812
2363	(2003 BH84)	55200	1.95953773	0.718398592	23.4100683	35.33539	283.41177	297.1022618
2364	(2003 CA)	55200	1.37928521	0.71958505	21.177343	234.638044	126.3327294	140.0145229
2365	(2003 CC)	55200	1.50039756	0.326782591	2.3233759	103.0841082	136.3812295	209.709569
2366	(2003 CR1)	55200	1.45369142	0.463017772	12.7146935	101.8272255	311.0964206	21.6524386
2367	(2003 CA4)	55200	0.92021146	0.119544143	7.4810451	173.0791128	139.9368492	123.041003
2368	(2003 CC11)	55200	3.13237187	0.59167604	11.5326018	359.7044395	135.4795682	86.5738598
2369	(2003 CG11)	55200	2.58573322	0.73687541	21.2776018	106.8932828	130.7568806	220.993358
2370	(2003 CH11)	55200	2.31525644	0.520550069	36.4200589	321.936648	134.650791	0.2220645
2371	(2003 CN17)	55200	1.84627442	0.517981762	32.0816612	265.4653381	330.9932921	243.8829235
2372	(2003 CL18)	55200	2.54136319	0.643691333	14.4666653	254.5234508	168.5397069	271.239942
2373	(2003 CO20)	52683	2.16287029	0.5404966	20.4747845	339.6923099	139.2638501	6.7377868
2374	(2003 CQ20)	55200	2.0923003	0.499700565	15.8550941	172.4117571	345.5599252	76.7488345
2375	(2003 DN4)	55200	1.14522157	0.477269577	36.3084427	141.5766631	157.8309462	119.3451931
2376	(2003 DE6)	55200	1.69958255	0.328427187	23.2000348	68.6474846	160.1902795	350.540337
2377	(2003 DF6)	55200	1.2206932	0.172636532	25.7857414	76.3229199	157.2523909	331.4292026
2378	(2003 DG6)	55200	2.00402516	0.604651964	8.9237899	36.3294256	40.3339506	170.071939
2379	(2003 DH6)	55200	1.46554613	0.313463649	19.1615509	180.6356243	340.3932945	308.4903053
2380	(2003 DW10)	55200	1.44633246	0.360861913	2.1967557	220.9162413	342.2545912	317.0499202
2381	(2003 DX10)	55200	1.37556637	0.410611881	3.1473876	193.7995598	61.9722199	36.5660548
2382	(2003 DC14)	55200	2.88001769	0.565445322	12.9162476	9.9015311	50.032356	179.9090737
2383	(2003 DY15)	55200	1.23008675	0.328143938	6.3102431	252.9228685	342.9549515	324.2955558
2384	(2003 DZ15)	55200	1.22056398	0.486783514	3.6517591	263.5723656	142.010111	84.2462623
2385	(2003 DA16)	55200	2.59418594	0.624714354	45.6828597	282.6769565	159.1745436	250.8803942
2386	(2003 DF16)	55200	1.78269576	0.436579127	26.2709774	100.7250273	2.9446859	341.9548457
2387	(2003 EG)	55200	1.73795113	0.714413121	31.753464	326.8331633	359.1235235	295.3761186
2388	(2003 ER)	55200	1.51254719	0.235917081	36.1068346	68.548828	156.0703878	197.4516131
2389	(2003 EM1)	55200	0.95760337	0.051848397	15.2698881	23.9541597	346.0398245	257.6675638
2390	(2003 EP4)	55200	1.35955519	0.644547897	0.5076706	66.0134083	212.7813309	76.4082461
2391	(2003 EG16)	55200	2.40021569	0.685875006	20.2720677	109.8643042	152.1148802	283.8689375
2392	(2003 EH16)	55200	2.34332685	0.531815768	18.0243918	100.7244736	359.141593	343.6242657
2393	(2003 EO16)	55200	0.93467046	0.249665684	13.2211296	167.8785342	178.030781	24.5733223
2394	(2003 EP16)	55200	1.71697026	0.395288961	8.4839147	312.6585351	163.1697406	34.2352706
2395	(2003 EZ16)	55200	1.17578844	0.139672397	5.8045432	71.4572565	341.9789126	228.5696393
2396	(2003 EC50)	52712	2.16261297	0.579039011	5.8810784	201.4093811	21.271779	347.6834812
2397	(2003 ED50)	55200	1.41608697	0.546663508	33.7311494	93.9366645	173.6030974	339.9860373
2398	(2003 EJ59)	55200	3.21257654	0.620314459	13.4223608	167.2952971	0.3607561	66.2043203

#	Object	Epoch	a	e	i	w	Node	M
2399	(2003 EW59)	52717	1.89287477	0.675734028	5.4375544	281.1214696	165.262136	20.1683135
2400	(2003 FB)	55200	1.47308689	0.442012351	16.9772603	46.1223781	38.7141566	327.7769896
2401	(2003 FG)	55200	1.24155986	0.715092582	15.6521375	312.7824328	7.106742	279.1923064
2402	(2003 FH)	55200	1.38881851	0.540675295	25.8035113	274.2775432	24.2402829	354.0821335
2403	(2003 FH1)	55200	1.18384578	0.43959887	14.6444822	29.0835545	40.2730627	158.7353236
2404	(2003 FJ1)	55200	2.17307463	0.815491874	20.8774698	181.7865115	128.7223804	20.0216767
2405	(2003 FK1)	52724	0.70741718	0.485941782	23.3756041	196.512784	177.5926446	158.5479562
2406	(2003 FS2)	55200	2.40655897	0.507617617	13.4362354	27.3203453	192.2985454	285.134965
2407	(2003 FT3)	55200	2.67134782	0.572079413	4.3232119	84.1446829	182.1149299	178.0671524
2408	(2003 FU3)	55200	0.85848236	0.394075685	13.0414357	339.2708735	21.6445384	29.0080204
2409	(2003 FV3)	55200	2.18370693	0.484121311	22.1595738	119.3423009	16.6866255	53.5438595
2410	(2003 FB5)	52730	2.51496981	0.788478726	5.3487331	288.3216935	358.4418193	348.4205093
2411	(2003 FC5)	55200	1.91674863	0.609255227	5.8225167	270.602647	189.33071	219.6832867
2412	(2003 FF5)	55200	1.36865079	0.303371264	6.3565054	54.1026245	192.9842814	48.6132298
2413	(2003 FQ6)	55200	1.37108241	0.131583142	3.6204441	233.4063045	86.6572741	317.7993599
2414	(2003 FR6)	55200	1.98703184	0.397574964	40.5648249	72.5472001	186.1275764	115.1901749
2415	(2003 FY6)	55200	0.73017779	0.581838341	6.6122946	29.5110373	359.353424	56.5153166
2416	(2003 FJ8)	55200	1.82149637	0.515468583	1.5725245	125.8006901	11.0167796	285.1755491
2417	(2003 GA)	55200	1.2814536	0.191206787	3.8414764	66.7169387	192.9632097	192.0682116
2418	(2003 GD)	52735	1.60430512	0.367351333	31.3645563	160.3877697	13.5098966	8.1369154
2419	(2003 GJ)	55200	2.66890727	0.513152157	7.8600706	210.1015338	20.4081598	186.0641399
2420	(2003 GR)	55200	1.38465694	0.317792926	55.8315655	273.1046354	21.1569683	353.3945718
2421	(2003 GS)	55200	0.89277255	0.21841379	12.0345871	181.8402376	196.3094542	164.5456474
2422	(2003 GW)	55200	1.82076744	0.476044213	49.4359939	90.6722304	183.2551338	214.8651849
2423	(2003 GX)	55200	1.33001055	0.207159922	10.8510189	168.0235406	19.6240456	148.5504511
2424	(2003 GY)	55200	1.37982018	0.317250151	4.6686508	333.9594807	322.04656	352.2030884
2425	(2003 GF21)	52737	1.76580293	0.488480062	21.8316705	221.5420356	20.1123523	344.9982519
2426	(2003 GG21)	55200	2.14015109	0.711330321	10.1323328	95.6111314	12.6463887	69.4445206
2427	(2003 GH21)	55200	1.4819819	0.261965545	20.0885901	311.7761365	198.479641	293.057979
2428	(2003 GJ21)	55200	1.81112072	0.399632129	7.0646322	207.1851105	32.9127826	258.4721938
2429	(2003 GQ22)	55200	0.87248391	0.182126681	17.0234685	168.6955464	199.5878897	286.9198852
2430	(2003 GR22)	52738	1.57361682	0.617649145	6.2606051	276.3945944	23.75174	331.8042586
2431	(2003 GS22)	55200	2.73880223	0.583659027	2.5914693	5.4967393	147.8041882	183.8995412
2432	(2003 GB34)	55200	2.57319849	0.677872318	27.2487196	255.6700671	201.731043	251.6808982
2433	(2003 GU41)	55200	2.04467768	0.667272369	18.9621782	195.0893305	89.1926398	89.1280705
2434	(2003 GD42)	55200	1.29439881	0.228770053	12.2395883	156.1878158	18.1605184	222.0817214
2435	(2003 GP51)	52752	2.15380503	0.602558174	2.856948	357.530233	141.8721504	17.9638603
2436	(2003 HB)	55200	0.84969562	0.380604424	18.1100217	306.6998309	70.4409232	32.0858874
2437	(2003 HM)	55200	0.81317912	0.270352756	26.2745577	19.2277349	30.4999017	196.9426797
2438	(2003 HN)	55200	2.02635907	0.509320055	10.7669295	64.3214107	213.2279097	94.2755753
2439	(2003 HG2)	55200	1.06218723	0.13460162	19.7746199	225.3120417	214.2994164	164.2293258
2440	(2003 HB6)	55200	2.70171889	0.575120786	6.3132906	142.2052827	164.1592309	150.3479255
2441	(2003 HW10)	55200	1.79758196	0.532356521	3.9160495	239.2542261	37.8737218	261.5703387
2442	(2003 HW11)	55200	2.35151924	0.466850859	7.402586	154.3455484	150.4629193	273.1220307
2443	(2003 HN16)	55200	1.28818285	0.210833249	26.1906011	338.9779358	215.503561	119.6007672
2444	(2003 HA22)	55200	1.87644109	0.394719827	1.6074953	163.4330283	121.8227167	186.2058801
2445	(2003 HP32)	55200	2.69772674	0.777977797	3.4354859	155.4799244	188.0127643	156.2288146
2446	(2003 HQ32)	55200	1.97915048	0.345277122	35.8504681	291.1930299	217.7084164	173.2088667
2447	(2003 HR32)	55200	1.74817344	0.687561884	8.2911737	352.5690916	342.0364389	281.983213
2448	(2003 HS42)	55200	1.45888918	0.121259118	15.8240872	192.1432587	38.3117356	279.0168675
2449	(2003 HT42)	55200	0.8145306	0.261914842	4.8805966	352.1207559	38.9075901	223.8028737
2450	(2003 JX2)	55200	1.11450465	0.242319826	9.6351288	276.3294233	219.2921927	300.8361719
2451	(2003 JY2)	52763	1.42894735	0.602490683	4.9339991	70.8424765	47.8514282	33.6140148
2452	(2003 JG4)	52766	2.28165968	0.451758821	2.1841343	328.568994	238.8733011	5.7598293
2453	(2003 JC11)	55200	2.92810652	0.558350056	21.0536897	70.747898	74.9020207	147.8254612
2454	(2003 JD11)	55200	1.7533207	0.544494412	8.5090354	74.9669943	220.7404512	292.3709483
2455	(2003 JC13)	55200	1.06592853	0.315089901	8.5060465	171.8937573	205.9254544	257.9801216
2456	(2003 JD13)	55200	1.68127341	0.271640422	40.8244428	351.5964416	226.1585282	25.5474501
2457	(2003 JN14)	55200	1.81591084	0.716579554	7.1956673	319.5381284	30.7376008	227.2585733
2458	(2003 JO14)	55200	1.2248864	0.34075019	7.101155	95.7480695	50.0095011	13.3317127
2459	(2003 JP14)	55200	2.11254619	0.543393838	13.5752742	126.5799436	52.8860101	74.3309615
2460	(2003 JV14)	55200	1.63354986	0.579325101	5.4628361	33.1924293	99.1072922	99.7836772
2461	(2003 JC17)	55200	2.3452082	0.715171979	27.3165975	40.4904325	80.7127112	332.452333
2462	(2003 JD17)	55200	2.45816845	0.551705269	21.0833315	34.1801113	219.5117964	256.8493472
2463	(2003 KO2)	55200	0.72739173	0.51088015	23.5015488	203.9663059	215.5139423	54.7554439

#	Object	Epoch	a	e	i	w	Node	M
2464	(2003 KU2)	55200	2.69637377	0.675394522	5.4023739	246.5670863	105.4415472	145.9049926
2465	(2003 KF4)	55200	2.32477222	0.575320159	8.2538135	156.669811	61.0295206	317.5630039
2466	(2003 KW16)	55200	1.52542969	0.258062571	38.3929854	52.0953675	247.3966541	150.7426901
2467	(2003 KX16)	55200	1.33462522	0.578995196	23.6359673	28.2448303	94.3536261	157.8436831
2468	(2003 KN18)	55200	1.74771362	0.486860007	11.906967	354.573848	168.7491144	3.8976045
2469	(2003 KQ18)	55200	1.44907783	0.22345614	21.4775165	152.1009148	72.8270637	297.4653427
2470	(2003 KR18)	55200	2.3427904	0.483109771	5.5810051	86.0077384	244.6508159	281.663811
2471	(2003 KZ18)	55200	0.94876516	0.330464394	23.9009885	154.6616632	250.0362619	273.2579688
2472	(2003 LG)	55200	1.91463797	0.735141109	11.923064	18.6605562	124.6407644	198.7687925
2473	(2003 LH)	55200	0.96049032	0.149658746	10.7956033	238.1825505	247.3129354	110.5484392
2474	(2003 LW1)	55200	2.12023404	0.51025005	12.404961	198.8258831	75.1706063	42.0049876
2475	(2003 LW2)	55200	1.87711531	0.479273944	2.2945884	335.2769868	247.1816356	211.7304051
2476	(2003 LS3)	55200	2.65489355	0.524039924	9.5273279	175.1391344	158.1152376	165.9854742
2477	(2003 LX5)	55200	2.7989598	0.5368235	1.26961	148.55408	38.61485	164.44751
2478	(2003 LN6)	55200	0.85687181	0.210541267	0.6328983	210.5146815	215.7283261	299.8382989
2479	(2003 LO6)	55200	2.90802255	0.575958079	34.5940435	6.5502611	254.3319863	126.0459715
2480	(2003 MA)	55200	1.64156915	0.301864995	21.9527674	158.1159777	96.0552349	40.8377673
2481	(2003 MM)	55200	1.05320962	0.256370141	8.5419131	19.759668	127.7223098	111.1159105
2482	(2003 MN)	52813	2.30778088	0.602895417	2.6754574	59.5372622	254.3890905	350.8607336
2483	(2003 MO)	52816	1.96654084	0.877084409	21.3258291	164.4184204	240.2448504	343.3917113
2484	(2003 MT)	55200	2.78070172	0.563770072	25.3839976	43.6863681	258.7564571	137.690879
2485	(2003 MU)	55200	2.05337162	0.494516459	5.8904192	175.5381986	143.7264541	60.6094409
2486	(2003 ME1)	55200	1.04047365	0.30292833	21.0543686	255.5782497	268.6650523	127.686195
2487	(2003 MS2)	55200	1.04173383	0.126330423	20.0265081	254.5705061	100.9013246	341.9660013
2488	(2003 MT2)	55200	2.68292626	0.535414317	27.9188375	304.6284404	305.1902065	190.6294218
2489	(2003 MH4)	55200	1.96253348	0.515015931	3.8745568	322.8753884	260.0053159	153.7233318
2490	(2003 MJ4)	55200	2.30794133	0.56060757	5.315996	270.586889	78.2980664	293.1261395
2491	(2003 MK4)	55200	1.08039557	0.181246474	22.3173209	109.5162004	282.6444178	199.1993933
2492	(2003 MC7)	55200	1.37374279	0.184244942	21.2111371	101.1431537	137.0903897	55.0373415
2493	(2003 MD7)	55200	1.46703338	0.594501342	5.7888619	185.1681155	200.5802362	197.3135096
2494	(2003 ME7)	55200	1.78046434	0.294298382	19.1033431	351.7112581	256.2832522	280.7283691
2495	(2003 MV7)	55200	1.65681321	0.23939698	10.3766865	200.408266	136.4318696	349.0760769
2496	(2003 MW7)	52822	1.16992285	0.548477397	20.5378859	52.5450308	107.0766228	55.0443171
2497	(2003 MT9)	55200	2.53630256	0.921013969	6.8257498	200.6323112	233.3609236	208.4840059
2498	(2003 NB)	55200	2.12655622	0.401512842	5.9706032	31.755778	281.2880308	25.3762043
2499	(2003 ND)	55200	2.21999557	0.45073793	5.115445	23.1997512	297.2456613	340.3649968
2500	(2003 NW1)	55200	2.42643237	0.639256903	6.0858004	117.2068956	266.4306916	239.3125223
2501	(2003 NO4)	55200	1.71486117	0.312858276	22.6978136	171.0996003	135.4303609	316.4733487
2502	(2003 NZ6)	55200	0.79323174	0.492421393	18.2362048	311.5680735	124.6769908	321.7734532
2503	(2003 NL7)	55200	2.13851176	0.451254887	6.8732612	341.8572068	306.6873845	29.3614329
2504	(2003 OU)	55200	2.30551196	0.701519284	40.0466535	175.3891965	206.3728644	262.0212086
2505	(2003 OV)	55200	2.2375525	0.8587831	10.0642808	146.8548463	262.7221243	318.5430177
2506	(2003 OA3)	55200	1.80548312	0.34827186	17.6659705	148.1897482	189.7295383	212.4562246
2507	(2003 OC3)	55200	2.24647209	0.598938586	13.1983524	22.5570307	172.6590418	350.5124894
2508	(2003 OB4)	55200	2.90477559	0.55496118	8.10639	111.6561552	195.9154442	102.5878178
2509	(2003 OQ13)	55200	1.30241383	0.16076771	16.150311	152.7954186	123.7885534	143.7921885
2510	(2003 OT13)	55200	1.17361194	0.171852775	13.1180459	242.4414775	135.6177545	328.1915849
2511	(2003 PN5)	55200	1.43473472	0.277403458	10.5410447	142.4413242	134.9345931	285.9859993
2512	(2003 PC11)	55200	2.8795306	0.573426248	22.8953752	9.543759	342.4886975	113.3707442
2513	(2003 QA)	55200	2.33917607	0.708249247	10.1926615	0.3436643	233.1209343	299.3600091
2514	(2003 QC)	55200	2.57260257	0.531510911	7.8564318	37.42031	321.7394375	188.0697895
2515	(2003 QH5)	55200	1.26021595	0.220483937	17.6133392	321.1066592	299.3022286	224.9084503
2516	(2003 QK5)	55200	1.2667871	0.159758686	17.0156414	129.1082993	148.4320497	207.0035289
2517	(2003 QU5)	55200	1.43619994	0.326182957	2.140701	85.3090274	288.0314195	230.1596077
2518	(2003 QC10)	52878	1.37548387	0.731852072	5.0356932	120.4301158	0.3473754	328.3023632
2519	(2003 QQ10)	55200	2.2527325	0.424610321	7.0257478	4.583306	344.8661067	311.9436596
2520	(2003 QY29)	55200	2.63489525	0.590344524	16.4238536	348.6474323	326.9159172	178.8978849
2521	(2003 QZ29)	55200	2.47870468	0.602569317	8.718636	251.0701768	162.8660522	205.3765574
2522	(2003 QA30)	55200	2.35376659	0.542879083	9.1714624	138.6782518	157.9007551	284.4448899
2523	(2003 QB30)	55200	1.23029698	0.417447425	0.6418348	107.4798027	315.1719206	192.9978233
2524	(2003 QW30)	55200	1.05339934	0.331719483	11.2774955	303.0924812	164.6164669	228.4624987
2525	(2003 QA31)	55200	1.73637008	0.547537271	8.3403025	90.3274188	169.5337928	310.1834396
2526	(2003 QB31)	55200	2.14532936	0.429557198	5.9970398	119.4764383	192.1149216	16.7087112
2527	(2003 QN47)	55200	1.73541051	0.368790115	28.0089741	324.1222307	349.4285044	295.3810737
2528	(2003 QF70)	55200	2.21301575	0.464991992	6.3060625	136.8158664	238.7413443	323.7469539

#	Object	Epoch	a	e	i	w	Node	M
2529	(2003 QR79)	55200	1.27857039	0.305442508	17.1663408	103.1298017	333.1022138	78.925764
2530	(2003 QB90)	55200	2.31706517	0.475896526	4.8488881	208.287483	129.4921667	296.7390919
2531	(2003 QL96)	55200	2.80441457	0.624195091	6.6675887	321.266487	347.337061	132.1338749
2532	(2003 RM)	55200	2.9127691	0.604751157	10.8777021	324.570886	336.7421541	105.6310567
2533	(2003 RS1)	55200	2.80682095	0.628559563	2.4331525	161.7308615	174.0660169	126.6693393
2534	(2003 RC2)	55200	1.52520054	0.37108945	42.3156196	273.149486	165.7004292	83.5764306
2535	(2003 RE2)	55200	2.46609106	0.54183249	2.4984411	33.1051769	299.4487258	231.5004499
2536	(2003 RB5)	52888	1.88577247	0.471996895	44.6326978	27.5770999	341.9322692	351.8045396
2537	(2003 RD5)	52890	1.39901445	0.247394852	8.7238214	170.0474893	155.908114	12.1648173
2538	(2003 RP8)	55200	1.73347981	0.365847548	31.2353773	22.2570998	301.4760808	283.2844928
2539	(2003 RL10)	55200	2.44954321	0.554873423	17.7081156	141.3967744	222.090641	229.0402126
2540	(2003 RN10)	55200	2.2310652	0.540831574	39.6311499	4.6273716	267.2441811	331.1189289
2541	(2003 RW10)	55200	2.15005713	0.435302935	7.4150556	307.0928119	349.9056857	16.6701881
2542	(2003 RU11)	55200	0.88910176	0.183001207	4.6587381	316.5104209	178.3975855	60.0315268
2543	(2003 RW11)	55200	2.63622171	0.823125988	10.376514	53.3399821	170.9606002	192.3490366
2544	(2003 SF)	52902	2.16185224	0.777817674	5.7370588	31.77804	77.6767553	342.4671184
2545	(2003 SY4)	55200	2.47766827	0.611826579	3.9226734	327.6746095	353.8080389	228.132359
2546	(2003 SK5)	55200	2.09750335	0.456620342	6.649633	318.65715	336.411141	51.1668158
2547	(2003 SL5)	55200	2.11232346	0.474336206	6.1052757	279.7791525	39.9192666	31.5239326
2548	(2003 SC11)	55200	1.43981164	0.2903182	43.5127737	287.6274609	177.6605556	153.3564869
2549	(2003 SQ15)	55200	1.66551101	0.458519325	45.3696311	327.9289961	333.9915865	352.7745963
2550	(2003 SR15)	55200	1.27733955	0.278058125	14.0889968	255.5474448	176.2760454	78.4671182
2551	(2003 SY17)	55200	2.0455417	0.580813973	33.0863762	218.4657818	350.5633915	139.0770408
2552	(2003 SK36)	55200	2.33659016	0.473464895	2.7890241	134.2677981	202.7491507	282.0343643
2553	(2003 SL36)	52903	1.41586588	0.407495913	3.9782776	289.0501132	359.0934617	30.9788839
2554	(2003 SH84)	55200	1.70011758	0.315504142	2.322642	134.5352243	268.7782718	278.1173632
2555	(2003 SJ84)	55200	1.73795466	0.28407632	36.6577329	306.9956225	183.1221506	163.1055518
2556	(2003 SK84)	55200	2.5337467	0.743067312	8.9462293	118.2048038	344.2686017	186.2742012
2557	(2003 SM84)	55200	1.12548051	0.082085496	2.7948281	87.3595713	186.7307599	170.9656895
2558	(2003 SR84)	55200	1.70654452	0.476467628	7.5311079	229.6739876	183.4248853	275.9845811
2559	(2003 SS84)	55200	1.93053889	0.570398201	5.4961969	234.6173197	198.3909608	101.994198
2560	(2003 SU84)	55200	1.49900517	0.385405393	16.4605963	95.4797587	181.9061597	193.3153171
2561	(2003 SA85)	55200	2.12791911	0.49737752	5.7272092	128.419259	205.3470348	15.2581117
2562	(2003 SW130)	55200	0.88373336	0.303905581	3.6668574	47.7091275	176.4831767	303.4612979
2563	(2003 SV159)	55200	2.1624236	0.519543998	5.0167347	135.6407301	200.1387154	357.5445912
2564	(2003 SD170)	55200	2.19986829	0.470012962	8.2397809	356.6310778	278.7728855	10.2178241
2565	(2003 SF170)	55200	2.20320826	0.424603381	28.625129	291.3467817	9.5496782	357.2915336
2566	(2003 SJ170)	55200	2.58186951	0.558254071	15.6863448	121.0491223	201.2990945	194.5501804
2567	(2003 SD201)	55200	3.03018695	0.641077187	20.9429422	284.6586496	11.5369431	79.8887435
2568	(2003 SN214)	55200	2.03566089	0.549000497	8.3329174	284.5321573	353.5295894	82.2868131
2569	(2003 SS214)	55200	2.36362699	0.535797846	8.1105617	194.8826218	212.0917037	250.1492024
2570	(2003 SU214)	55200	2.5827138	0.535674615	5.648016	65.4123884	8.2473152	167.3066526
2571	(2003 SH215)	52909	2.24137657	0.439907316	2.0341326	255.8972033	83.0659264	6.347982
2572	(2003 SJ215)	55200	2.2059954	0.424476443	6.1550736	154.9999539	269.9760342	299.3020644
2573	(2003 SK215)	55200	1.85181536	0.446322537	36.0106754	288.9543857	2.8448969	203.373067
2574	(2003 SL215)	55200	2.71835081	0.527917523	7.8359305	133.9308984	242.051194	140.8613297
2575	(2003 SM215)	55200	2.10327486	0.561471811	4.9877061	40.9281629	5.8741966	9.7383744
2576	(2003 SN215)	55200	2.587449	0.551748049	10.6004757	205.808794	191.44009	172.910583
2577	(2003 SQ222)	55200	1.50587668	0.518717342	3.5607309	280.7385379	4.5274746	168.7668932
2578	(2003 SV222)	55200	1.74541267	0.389569082	19.4119309	75.1117422	234.5839589	301.1751579
2579	(2003 TK)	55200	2.06673593	0.448781043	4.3948544	10.9014001	258.8538479	86.5990908
2580	(2003 TK1)	55200	1.52127892	0.292955332	5.7267643	186.0995296	200.125984	110.8014664
2581	(2003 TL1)	55200	2.5734445	0.513327441	8.2065453	132.5100682	246.4280324	181.657465
2582	(2003 TM1)	55200	1.36180385	0.56267976	1.7043109	354.8910953	271.5119831	16.5401579
2583	(2003 TN1)	55200	1.43274557	0.135905563	19.2330677	54.5251285	13.7219829	196.8599442
2584	(2003 TG2)	55200	0.9077878	0.315933516	25.4337439	355.1321346	200.7108476	241.4423185
2585	(2003 TH2)	55200	2.45223726	0.669930397	1.3917471	44.3231806	50.2878214	210.4489669
2586	(2003 TJ2)	55200	1.31808726	0.474244282	17.4425463	298.9045614	341.5542083	82.9409314
2587	(2003 TK2)	55200	2.34277199	0.650397725	4.2940923	320.9064954	1.0397975	278.421902
2588	(2003 TL4)	55200	0.77654948	0.3818431	12.146508	321.8721089	220.1393112	258.1269887
2589	(2003 TX7)	55200	1.44811216	0.207415256	38.7473339	270.5172265	204.1318542	129.3905086
2590	(2003 TO9)	55200	2.4265689	0.603677923	3.1095993	225.0843914	198.0638888	222.5128483
2591	(2003 TR9)	55200	1.64116307	0.700992343	13.4819709	70.745096	198.6561704	14.7811325
2592	(2003 TT9)	55200	1.09635442	0.269589856	19.0133348	252.871509	20.4311293	227.6275109
2593	(2003 TX9)	55200	2.15174266	0.472419795	8.4099262	80.8473873	4.2380655	328.2877059

#	Object	Epoch	a	e	i	w	Node	M
2594	(2003 UE)	55200	2.34497562	0.44909976	24.6028994	210.9485307	216.2711399	248.3124635
2595	(2003 UL3)	55200	2.24400487	0.798001305	14.6559003	12.9613775	153.1586573	269.2650874
2596	(2003 UM3)	52930	1.371094	0.440516806	1.5148621	284.5431501	17.6675403	35.6717211
2597	(2003 UQ3)	55200	2.62524297	0.523694595	12.8462543	356.071183	40.2669372	157.8912771
2598	(2003 UB5)	55200	2.61581013	0.597024431	10.537034	353.2616457	83.0637823	156.8647243
2599	(2003 UC5)	55200	1.18535529	0.818225581	36.8379809	210.5913017	31.0077956	331.8244731
2600	(2003 UD5)	55200	2.34268734	0.563665804	5.3592634	17.5677026	32.5080313	256.4976155
2601	(2003 UW5)	55200	2.46976969	0.576841177	1.8685327	52.4332059	16.8613723	205.2991876
2602	(2003 UX5)	55200	1.44098155	0.340674732	21.4524307	50.295145	50.5882434	175.6774762
2603	(2003 UD8)	55200	2.72709895	0.531396975	3.8740238	107.7875149	238.9565153	137.9517278
2604	(2003 UE8)	55200	1.93503707	0.472462758	6.5520056	353.3073388	33.6979905	110.3993925
2605	(2003 UL9)	52934	1.01244195	0.228787222	62.9654499	228.9335182	23.3386704	110.1621509
2606	(2003 UC10)	52936	2.43773535	0.637839571	1.5218273	254.7634847	68.7097241	13.670573
2607	(2003 UV11)	55200	1.45119459	0.762887045	5.9460734	124.7103174	32.0521568	165.4950024
2608	(2003 UL12)	55200	3.29606109	0.699692995	19.7245807	274.7377821	193.2698982	4.3772484
2609	(2003 UN12)	55200	2.15692635	0.403583189	6.9079728	257.371478	40.8286456	34.2757816
2610	(2003 UQ12)	55200	2.80683746	0.659012697	0.9981169	80.1414152	3.8630826	104.3677401
2611	(2003 UP12)	52935	1.78685084	0.490688309	13.9274254	231.4355686	208.4608546	343.5138131
2612	(2003 UQ12)	52936	1.7083241	0.524674025	5.4033923	291.4041728	31.8325811	21.4042858
2613	(2003 UR12)	55200	2.43149431	0.568028615	60.4822008	122.3751161	194.0112806	241.305789
2614	(2003 UY12)	55200	0.70088258	0.595934835	16.5036125	200.6059104	22.9386275	332.4010744
2615	(2003 UY19)	55200	2.45925983	0.582201884	7.5843048	319.4619558	51.0943532	225.1893491
2616	(2003 UC20)	55200	0.78130557	0.336777342	3.7948409	59.2892482	188.8606998	118.7628628
2617	(2003 UB22)	52936	1.21940625	0.225399524	15.8609801	116.0524216	212.4841837	39.4435768
2618	(2003 UC22)	55200	2.15861194	0.417738705	4.7812498	151.7287734	232.5270623	346.075991
2619	(2003 UD22)	55200	1.16870398	0.318234203	10.0782076	23.4285758	253.9064332	35.2104829
2620	(2003 UC22)	52938	2.34047072	0.546331161	8.1272083	355.682912	29.5480172	1.6669396
2621	(2003 UF22)	55200	1.88456632	0.379729395	11.7073601	13.2115263	27.973688	141.1498569
2622	(2003 UG22)	55200	1.42406769	0.354225008	20.2962184	280.6373315	33.1912795	275.2742384
2623	(2003 UP24)	55200	2.23797243	0.495862753	21.6755028	237.7252601	213.1414192	287.0322418
2624	(2003 UQ25)	55200	1.01641036	0.228756179	15.4741003	28.5208471	21.9014176	152.309504
2625	(2003 UP25)	55200	1.26646939	0.155932706	19.9447324	344.0935939	29.5522957	136.3900738
2626	(2003 UQ25)	52941	2.53833928	0.681620768	2.1335226	276.4839267	187.615219	348.4455468
2627	(2003 UR25)	52937	1.90563331	0.492142292	5.5720846	47.3260387	23.6130114	347.6648862
2628	(2003 UX26)	55200	1.1547175	0.365287659	4.5446818	263.9988344	35.3612427	48.9814001
2629	(2003 UW29)	55200	1.16962646	0.83837489	3.7621894	55.0086033	196.7140367	8.2298095
2630	(2003 UX34)	55200	1.09512475	0.61572849	2.5662236	218.1852926	4.6571635	277.342729
2631	(2003 UT55)	52939	0.97915383	0.147045311	17.0589517	287.432368	212.8114478	269.3944711
2632	(2003 VE1)	55200	1.94292854	0.49500717	16.3113916	323.0771241	29.667769	119.5576333
2633	(2003 VF1)	55200	1.67543503	0.378855469	53.5872143	98.6366669	47.0195122	261.6674213
2634	(2003 VG1)	55200	2.69847853	0.575307568	8.8071252	135.2631181	331.8804735	127.9876912
2635	(2003 VO2)	55200	1.31513843	0.100486724	7.1211284	229.0619171	268.6890097	305.5883941
2636	(2003 WE)	55200	1.19820607	0.241410372	5.3637974	285.2250414	58.4563148	288.4598672
2637	(2003 WG)	55200	2.44052062	0.783486762	27.1413026	261.8365748	46.875625	231.994698
2638	(2003 WO7)	55200	2.15205464	0.435407596	7.6694119	245.6693866	91.3388427	19.8639276
2639	(2003 WP7)	52966	2.29727788	0.643565739	1.0206102	235.9851055	252.9112991	346.1380112
2640	(2003 WQ7)	55200	1.80037575	0.453985838	17.7824789	99.9389934	38.7714211	155.9472249
2641	(2003 WP21)	52967	2.29240035	0.786609926	4.31041	123.6445449	38.0767203	344.2555394
2642	(2003 WQ21)	55200	1.34523447	0.160659432	19.9143596	192.6322684	230.3879539	327.4467398
2643	(2003 WR21)	55200	1.11900093	0.261590905	9.274937	107.9002771	85.9245699	304.7171551
2644	(2003 WU21)	52966	0.90863991	0.544511504	28.5390076	140.6487416	57.5976988	280.4594529
2645	(2003 WB25)	55200	1.78503412	0.288435843	29.7944063	210.8637807	260.0365782	180.9934703
2646	(2003 WL25)	55200	2.39843969	0.740674325	23.7542933	25.0071521	267.1559918	273.9532491
2647	(2003 WM25)	55200	2.61623867	0.567607882	12.2280538	295.1579059	67.8948591	185.7871317
2648	(2003 WR25)	55200	3.35741717	0.709835506	8.9957497	245.2404524	117.5319119	6.140601
2649	(2003 WX25)	55200	2.90946366	0.582936773	23.9714429	39.3533428	40.0850056	73.6064131
2650	(2003 WY25)	55200	3.0506607	0.683683225	5.8957841	9.8029269	68.959197	45.979236
2651	(2003 WW26)	55200	2.39636167	0.799046927	6.3035687	254.7703634	57.5528571	247.2915321
2652	(2003 WW87)	55200	2.59396128	0.573704231	46.9775678	348.9851547	46.1537475	163.8796998
2653	(2003 WX87)	55200	2.30063211	0.494136603	13.0151885	324.4024613	98.6157417	283.1290757
2654	(2003 WY87)	55200	2.40790327	0.517143106	9.4345058	6.0824468	54.2471008	228.3151394
2655	(2003 WH98)	55200	2.15006698	0.536311773	3.5436246	353.4666296	68.7043551	338.0864012
2656	(2003 WJ98)	55200	1.26190368	0.205372535	22.8622326	34.2617402	66.8654794	84.2470059
2657	(2003 WO151)	55200	1.54515297	0.663189857	19.7911825	330.7650825	228.1547459	3.65849
2658	(2003 WT153)	55200	0.89370056	0.177652679	0.3706882	148.4469584	56.0221614	329.3487207

#	Object	Epoch	a	e	i	w	Node	M
2659	(2003 WU153)	55200	1.86362996	0.310601542	27.3141824	314.4954975	74.0941542	156.7706995
2660	(2003 WX153)	55200	2.18600923	0.602229324	32.6257686	62.8137374	91.7238292	295.3093722
2661	(2003 WY153)	55200	2.46288353	0.591838378	1.1781024	211.3106002	210.9149313	208.1516415
2662	(2003 WE157)	55200	2.24728542	0.566289432	9.6279196	264.5669329	226.5636131	271.4319128
2663	(2003 WC158)	55200	2.63098938	0.632459602	8.9962805	144.1465618	251.3330404	155.7316722
2664	(2003 WD158)	55200	1.42694572	0.409434907	16.7115743	102.1759519	92.3498235	133.6198646
2665	(2003 WH166)	55200	1.93310843	0.557594289	0.6880376	328.355822	186.4533568	67.0850977
2666	(2003 XE)	55200	1.7124037	0.353262339	26.939814	17.3276824	90.604332	255.2599214
2667	(2003 XK)	52976	2.33540702	0.715442616	2.3265775	104.1337294	246.6152211	12.7373975
2668	(2003 XM)	55200	3.20321633	0.678171859	5.6108992	156.0596517	355.5421993	11.5483066
2669	(2003 XV)	55200	1.92148584	0.551782391	4.8056571	231.0833054	252.9548272	87.8692629
2670	(2003 XJ7)	55200	1.24295344	0.465861977	18.1749501	271.7093519	254.0428072	99.2959416
2671	(2003 XH10)	55200	1.32164654	0.243482357	9.6433035	12.3089261	70.6283663	355.553884
2672	(2003 XV10)	55200	1.4350553	0.679658267	11.5649124	321.3867884	1.9513569	222.0535367
2673	(2003 XF11)	55200	2.19316033	0.848824446	8.6381193	173.8658129	116.0387324	330.3897978
2674	(2003 XZ12)	52990	1.43782984	0.312468254	12.4028367	198.4295786	268.5120199	349.4962762
2675	(2003 XB22)	55200	1.40560037	0.393614916	29.943926	118.22371	108.858269	140.9021319
2676	(2003 YJ)	55200	0.93049469	0.19887877	19.4598701	165.6067422	89.8066941	113.7689349
2677	(2003 YM1)	55200	2.61064465	0.521773458	13.6103246	223.9602708	291.4052806	131.8785168
2678	(2003 YN1)	55200	1.33545361	0.24311564	5.2429689	147.935284	274.2356709	345.6689127
2679	(2003 YO1)	55200	1.15768874	0.399120603	14.2571345	161.3811744	65.1942085	191.3969434
2680	(2003 YP1)	55200	2.64154954	0.649412948	7.4016308	130.0456894	277.8500472	151.4409405
2681	(2003 YQ1)	55200	1.74581682	0.341088822	11.3167241	171.3503088	268.3162022	224.9492455
2682	(2003 YR1)	55200	0.89862298	0.450517791	29.2687261	138.0544514	86.4447358	306.0047175
2683	(2003 YS1)	55200	3.09387479	0.847291748	25.0611288	48.4856406	281.100004	54.2789797
2684	(2003 YW1)	55200	1.66588638	0.296685974	19.4022934	182.3553809	277.0153384	288.0586884
2685	(2003 YX1)	55200	0.8795889	0.266938713	5.7571162	223.0542016	89.7169844	226.7143662
2686	(2003 YO3)	55200	1.44915622	0.366010499	24.6129402	168.6792792	291.4387861	148.7823007
2687	(2003 YP3)	52995	1.34887884	0.493215401	37.2821283	282.1234853	260.4297417	317.001722
2688	(2003 YN7)	55200	2.76838791	0.696464137	19.6916412	280.9382897	94.3712159	126.0562603
2689	(2003 YP17)	55200	2.000151	0.486911414	4.9049925	30.9994823	144.5073888	12.8480136
2690	(2003 YS17)	55200	0.93075984	0.313194811	6.5239057	134.5294736	99.1712086	151.7607956
2691	(2003 YD45)	55200	2.48891519	0.695898957	8.4064616	104.3739557	252.7878191	208.6116591
2692	(2003 YR70)	55200	1.89532352	0.43120197	2.6640435	222.47679	301.6126746	86.3848595
2693	(2003 YS70)	55200	1.28755987	0.236729734	0.3530981	195.6515028	271.5891338	36.3754364
2694	(2003 YT70)	55200	1.59212989	0.34757006	0.3758978	10.4308895	74.0826542	6.2420316
2695	(2003 YP94)	53001	2.16419019	0.53462812	8.2108677	211.0428839	263.6840493	354.6842437
2696	(2003 YQ94)	55200	2.65317891	0.618405441	8.529413	85.7418788	272.5309087	178.7324071
2697	(2003 YN107)	55200	0.9891749	0.013865822	4.3203505	87.2025522	264.46806	131.8756729
2698	(2003 YH111)	55200	1.41826262	0.486298398	4.3667652	84.2339798	91.7942002	171.2441724
2699	(2003 YR117)	53004	1.86344626	0.504432118	17.3516606	317.3950481	95.0367116	14.699012
2700	(2003 YS117)	55200	1.24941035	0.330449317	29.5563308	322.0308892	300.4613635	345.434031
2701	(2003 YG118)	55200	2.28250399	0.644128853	8.1283902	232.2110917	348.5743171	230.6069999
2702	(2003 YL118)	55200	1.12980866	0.485862571	7.6128592	65.6061851	278.823798	58.0026987
2703	(2003 YT124)	55200	2.3197255	0.478725338	5.450462	117.4346852	327.1193027	260.518933
2704	(2003 YG136)	55200	0.96873346	0.354907736	2.7364787	127.917986	86.546274	35.2933056
2705	(2003 YH136)	53008	2.3296293	0.893932026	16.0198177	304.1828031	306.6900357	347.8795018
2706	(2003 YJ136)	55200	2.14183885	0.393834737	26.971201	170.5811294	288.2345432	333.505965
2707	(2004 AC)	53011	1.81039189	0.673265444	11.5431819	171.1755215	13.7301154	339.0636223
2708	(2004 AD)	55200	1.25869189	0.262787046	7.305151	302.3703917	110.6028416	119.0879508
2709	(2004 AE)	55200	1.43221243	0.332887088	18.729045	193.0598915	307.6478796	164.1999596
2710	(2004 AH)	55200	1.99591005	0.423197698	15.9878086	300.6348952	109.7510338	59.9567549
2711	(2004 AM)	55200	1.57154689	0.241072451	41.6765521	79.9349243	289.6590255	96.4422113
2712	(2004 AD1)	55200	1.91557301	0.562985007	6.1815931	109.7973006	300.1286426	109.2097663
2713	(2004 AR1)	55200	1.57652071	0.469581963	9.0768008	50.1121062	336.6819176	37.8708207
2714	(2004 AS1)	55200	1.07037366	0.174474217	17.2142448	261.845959	322.6046856	49.5133047
2715	(2004 AY1)	55200	1.88807567	0.573263481	5.5251476	2.1581739	40.0618692	127.0021084
2716	(2004 AE6)	53025	1.49175346	0.37788942	6.7181763	250.8855765	298.1502415	326.7464373
2717	(2004 BB)	55200	1.98118523	0.518099373	24.5564821	57.5572823	129.7600453	21.4906871
2718	(2004 BV1)	55200	1.46153902	0.364559042	12.101791	223.0428954	96.8185758	251.1476628
2719	(2004 BW1)	53025	2.32047501	0.523143077	4.299999	293.9047325	77.3489803	43.6448941
2720	(2004 BX1)	55200	2.39557057	0.843935233	19.0591849	167.9638304	93.474993	195.4431848
2721	(2004 BY1)	55200	0.88415586	0.222008271	3.6141606	28.1954369	298.9921243	200.4761971
2722	(2004 BE11)	55200	1.25166433	0.165742672	15.2491598	37.8666087	138.3233205	35.9430744
2723	(2004 BF11)	55200	1.89244732	0.406284866	1.8063054	199.0785053	277.1237651	104.7279711

#	Object	Epoch	a	e	i	w	Node	M
2724	(2004 BG11)	55200	1.77614635	0.487186048	34.1194447	83.8056439	108.2960062	146.8611672
2725	(2004 BH11)	55200	1.26590003	0.32777267	4.3521293	83.1727671	309.6946875	115.3788841
2726	(2004 BJ11)	53025	1.75201669	0.398012613	4.2697091	111.9484043	269.2413252	52.1355911
2727	(2004 BK11)	55200	2.064641	0.392151671	5.3753742	211.8442748	276.5168647	358.7154535
2728	(2004 BL11)	55200	1.2601716	0.749987705	9.8081851	176.8745001	142.4899259	171.5855046
2729	(2004 BM11)	53026	1.42224627	0.513041274	3.5499198	175.7306225	42.2082142	323.131565
2730	(2004 BV18)	55200	1.33456632	0.254321856	2.1725466	170.8474478	302.1131749	314.5118553
2731	(2004 BW18)	55200	1.37237508	0.252964572	5.1140408	200.9211335	303.0323732	238.236221
2732	(2004 BZ18)	55200	1.86644834	0.437257367	22.6110392	112.6487404	308.2542515	143.6629457
2733	(2004 BY21)	55200	2.4205823	0.474946126	6.5511299	155.5231976	40.3445058	177.5401178
2734	(2004 BG41)	55200	2.51412719	0.610759978	2.9542962	152.9314017	301.7506001	182.1921756
2735	(2004 BH41)	55200	1.19485045	0.500167381	30.4541168	200.3189909	123.2381294	332.5159411
2736	(2004 BN41)	53029	2.05672579	0.517221265	0.3976719	144.9418271	331.6490241	2.4853704
2737	(2004 BO41)	55200	1.0187407	0.492677879	35.5632081	254.4162963	337.8170695	235.2353897
2738	(2004 BT58)	55200	0.96081032	0.384978809	17.6686105	45.8145825	300.894476	214.3155925
2739	(2004 BW58)	55200	1.45501995	0.378722704	15.2076631	301.7320169	132.7281274	175.425283
2740	(2004 BX58)	55200	2.82321097	0.622885014	14.0088299	344.5783338	128.3941551	96.572972
2741	(2004 BD68)	55200	1.90120334	0.829668125	19.3097584	203.7248918	172.1825193	117.7633458
2742	(2004 BE68)	55200	1.75962238	0.444348379	15.7417867	191.1108089	210.9651268	224.9440994
2743	(2004 BZ74)	55200	3.04986422	0.891992035	16.6017312	121.3403577	233.8243236	50.5531867
2744	(2004 BA75)	53033	1.63243692	0.600114045	3.148339	253.5275762	135.0300745	30.1307675
2745	(2004 BB75)	53037	1.84936825	0.447699576	16.6021213	358.8220762	132.2885187	1.3046686
2746	(2004 BE85)	55200	2.69062533	0.520713944	23.9573593	267.7504548	276.6759042	106.2715289
2747	(2004 BF85)	53037	1.82775504	0.724253078	3.7156053	17.9669645	212.8469637	338.8840009
2748	(2004 BE86)	55200	1.44073601	0.237344823	3.781646	14.6729143	154.7967301	134.8608205
2749	(2004 BG86)	55200	1.35251824	0.613459952	36.1481766	123.3475749	146.7491504	234.4671533
2750	(2004 BJ86)	55200	1.75488175	0.329523565	31.4312173	65.3393578	124.1740972	158.9848818
2751	(2004 BK86)	53035	1.49907596	0.534777347	2.3809941	262.07135	311.3284741	332.299869
2752	(2004 BL86)	55200	1.50211146	0.403027123	23.7417801	311.2248759	126.7429411	110.4187184
2753	(2004 BS102)	53039	1.70788258	0.385727308	25.7139364	244.6219328	126.9539003	74.9979443
2754	(2004 BB103)	55200	1.90733617	0.621816368	55.8811155	71.499446	271.1891361	111.4809104
2755	(2004 BG121)	55200	1.61253898	0.342836502	19.4296461	206.6970605	128.7112212	98.6706694
2756	(2004 CC)	53040	1.42973826	0.308653284	7.5947435	199.1817936	324.3140398	346.3272998
2757	(2004 CL)	55200	1.28458338	0.536146028	13.3045509	274.4877118	109.5254054	67.4027886
2758	(2004 CQ)	55200	2.02982176	0.495042453	6.4081901	184.2858578	322.020278	12.1822679
2759	(2004 CS)	55200	1.86022865	0.38934219	15.1139962	189.1463369	334.9365447	104.0250295
2760	(2004 CL1)	55200	1.98025028	0.53344188	15.1879095	187.0936442	3.3104327	29.8315179
2761	(2004 CZ1)	55200	1.53981826	0.454470331	1.9987906	65.7462639	146.8948398	2.4142256
2762	(2004 CA2)	53050	2.10983382	0.614082686	3.252745	130.4044771	304.2562859	16.5875683
2763	(2004 CR2)	55200	2.46961513	0.534472731	3.1143293	243.4824719	355.2112636	147.9268894
2764	(2004 CD39)	55200	2.48650638	0.516927356	3.1585953	300.879524	229.239127	173.6386424
2765	(2004 CE39)	55200	1.02715576	0.391289549	17.7069401	126.0456322	153.2920262	146.3010861
2766	(2004 CK39)	55200	2.29816516	0.829195573	12.2522021	265.3174307	359.3752602	224.5884752
2767	(2004 CO49)	55200	1.37541718	0.388493685	4.2617885	315.7793594	115.2385782	270.245555
2768	(2004 CP49)	55200	2.24661167	0.503065224	23.4742259	69.4033019	151.9129018	245.1038737
2769	(2004 DC)	55200	1.6338207	0.399441744	19.4415619	156.1202606	75.0031201	267.6494791
2770	(2004 DD)	55200	1.58925421	0.459332857	11.5881144	8.4492237	3.7507143	71.1896393
2771	(2004 DK1)	55200	1.79876716	0.395811858	1.0265191	168.3156647	38.601671	133.2597311
2772	(2004 DL1)	53054	1.77624542	0.687951711	2.2379213	230.5549956	176.1397512	23.7352045
2773	(2004 DF2)	53055	1.65501552	0.65214871	5.2254429	89.5173787	325.226942	23.8091943
2774	(2004 DH2)	55200	0.94408407	0.400272347	23.0232374	216.0753363	157.3487721	250.546113
2775	(2004 DM44)	55200	2.47600665	0.710981095	10.5411964	95.5309916	350.9284932	193.7833746
2776	(2004 DA53)	55200	0.88367522	0.330214644	5.1408289	50.001291	336.6643795	110.5769925
2777	(2004 EB)	55200	3.13642112	0.652503531	21.3809682	236.8437058	23.1379059	351.9638683
2778	(2004 EH1)	55200	2.01362027	0.530940568	7.5416689	231.7278476	356.9774881	354.7105989
2779	(2004 EJ1)	55200	1.91114067	0.442067373	14.2587263	196.7139184	7.9969031	61.0137111
2780	(2004 EK1)	55200	1.2509675	0.251506513	11.6344213	300.4178939	167.0176298	97.1651139
2781	(2004 EU9)	55200	0.88041928	0.505248875	28.5898127	202.3852954	161.1249572	135.7547569
2782	(2004 EV9)	55200	1.47105922	0.780285784	40.886829	226.6131029	172.5297379	130.9658923
2783	(2004 EL20)	55200	0.81466722	0.268588442	7.5874413	337.6119746	356.1637618	177.372618
2784	(2004 EM20)	55200	1.10540418	0.523972342	14.1408107	314.7876244	343.866584	284.1669942
2785	(2004 EN20)	55200	1.86558097	0.379490473	40.1292854	246.3695384	185.626393	157.5744294
2786	(2004 EO20)	55200	1.21944015	0.055140647	4.5413392	84.2588653	179.8724601	25.6801472
2787	(2004 ER21)	55200	0.90013537	0.17099692	7.9559532	343.2269488	357.4086625	126.5321865
2788	(2004 ET21)	55200	1.63250747	0.323565395	41.6184065	248.1086638	171.0870718	0.8385064

#	Object	Epoch	a	e	i	w	Node	M
2789	(2004 EU22)	55200	1.17516248	0.162523006	5.3368066	328.4462234	175.8044465	222.6189142
2790	(2004 FA)	55200	2.12335441	0.589916402	9.1928136	55.9042924	180.192494	300.7180639
2791	(2004 FD)	55200	1.30175992	0.674245397	1.0204442	357.1729427	49.9036787	8.3290625
2792	(2004 FE)	55200	2.34604067	0.510602971	12.0778667	213.9504309	337.9673291	214.9083147
2793	(2004 FH)	55200	0.81801829	0.289148588	0.0212811	33.2997869	294.2372675	172.9702451
2794	(2004 FG1)	55200	1.75121238	0.285262191	24.1876719	21.6543015	187.431142	155.5086281
2795	(2004 FW1)	53084	1.60225779	0.714350055	10.1219499	90.7656049	195.0434892	333.5258471
2796	(2004 FX1)	53083	1.1332758	0.267872622	17.7903161	97.2568768	353.0302836	57.8633468
2797	(2004 FY1)	53083	1.95562518	0.588620141	8.982299	61.4237705	180.2565923	344.6355672
2798	(2004 FZ1)	55200	1.79358194	0.531073631	52.6315319	89.5483505	152.6765874	116.0589564
2799	(2004 FK2)	55200	1.33278214	0.231419014	11.4421187	19.3597649	177.8865668	264.2146446
2800	(2004 FY3)	53085	1.98051696	0.557036475	5.4255298	128.6885674	359.808324	13.7978594
2801	(2004 FD4)	55200	1.89089517	0.324049857	23.421982	245.1961638	345.9289616	52.159326
2802	(2004 FE4)	53088	1.39069649	0.235089015	15.7687057	198.7528341	358.7630022	351.1646367
2803	(2004 FM4)	53086	2.01470012	0.590963537	2.6771876	289.001146	186.0445966	16.4568252
2804	(2004 FP4)	55200	1.99787997	0.469191491	2.1225529	196.8453475	24.6645943	4.7363071
2805	(2004 FU4)	55200	1.26034319	0.263856724	23.2520618	46.2342391	31.6239332	133.9250826
2806	(2004 FA5)	53087	1.3066708	0.299472022	15.0109258	58.5520771	178.5147319	329.721062
2807	(2004 FE5)	55200	1.24504991	0.600233218	18.3100301	243.343511	189.513135	107.0914705
2808	(2004 FK5)	53087	2.24803209	0.551418286	5.5278858	173.4216123	2.4317998	1.5629914
2809	(2004 FZ5)	55200	2.15578403	0.40475678	23.4143557	44.7537485	181.0610719	278.3406462
2810	(2004 FN8)	55200	1.1689516	0.144571437	5.2573133	159.8038913	4.1232722	221.7684342
2811	(2004 FG11)	55200	1.58901697	0.724075568	3.1089482	227.4451816	84.7301073	289.141779
2812	(2004 FH11)	55200	2.25735588	0.44521082	21.3825631	88.0453343	203.6900826	226.8063183
2813	(2004 F111)	55200	2.2504177	0.559907898	2.4278395	230.9140974	22.0517536	236.3947104
2814	(2004 FY15)	55200	1.85519803	0.478771201	3.4986484	207.2708485	6.1345258	95.0583287
2815	(2004 FB16)	53091	1.79116296	0.414170977	12.7602227	181.6498039	4.7812699	0.0373765
2816	(2004 FM17)	55200	0.8858117	0.249779501	6.7624541	196.384354	169.9394131	175.5281236
2817	(2004 FN17)	55200	1.62910422	0.328446862	14.6571343	24.1861265	195.7540882	267.0126395
2818	(2004 FB18)	55200	1.66412404	0.368113033	5.7399767	23.1941832	185.8016875	238.7536606
2819	(2004 FC18)	53094	1.91388851	0.648823905	9.8364946	92.204697	181.6115489	340.5562406
2820	(2004 FF29)	55200	1.91702766	0.616959813	8.2015037	40.1215425	68.6483947	83.4075454
2821	(2004 FG29)	55200	0.87850257	0.492424614	3.5112165	142.0466109	183.3779211	276.8737965
2822	(2004 FH29)	55200	1.65464051	0.401634499	12.6310283	25.7467723	195.3952938	242.3897739
2823	(2004 FJ29)	55200	0.91346468	0.349129944	33.4672385	210.2710138	195.4615621	329.7771054
2824	(2004 FJ31)	53095	1.27065365	0.321728138	1.9435797	203.7812284	58.5218161	321.6028284
2825	(2004 FA31)	55200	1.26085487	0.441959102	24.7501601	285.7496127	169.2142253	70.9512457
2826	(2004 FY31)	55200	2.16625465	0.557122071	11.2819065	196.8086439	29.022867	281.7156687
2827	(2004 FC32)	55200	1.92228388	0.339297717	10.936957	172.7244082	80.9062611	25.6866394
2828	(2004 FM32)	55200	1.09847655	0.162038197	3.7616164	298.3239074	184.4973782	53.8698443
2829	(2004 FU162)	53100	0.82681962	0.392182616	4.1644361	139.7919939	191.2486113	262.6562692
2830	(2004 GA)	55200	2.81761617	0.635323344	10.547088	155.9690419	12.4700051	82.6608933
2831	(2004 GD)	55200	1.06440207	0.307569519	6.2221765	281.0260481	26.7167562	8.7294073
2832	(2004 GP)	55200	0.6965702	0.488435973	14.5471575	278.5671004	115.7404462	104.5204289
2833	(2004 GY)	55200	1.44843619	0.21808141	23.4358167	182.8057933	50.9125212	87.1989046
2834	(2004 GB2)	55200	2.11892053	0.650922793	12.4449725	254.9000947	209.4576667	331.9814788
2835	(2004 GD2)	55200	2.03590046	0.502807051	1.7761346	144.0772564	44.7538937	353.8253217
2836	(2004 GE2)	53112	2.04796343	0.7071781	2.1635008	259.9240409	45.1274538	341.6163717
2837	(2004 GZ14)	53111	1.38494296	0.322970038	20.8846316	308.165116	200.8505007	29.8466238
2838	(2004 GB19)	55200	1.35756073	0.366152639	1.2818758	327.2796119	162.9631653	259.2343997
2839	(2004 GC19)	53114	2.13898493	0.556493397	8.6675069	48.6229826	200.0143919	349.9669253
2840	(2004 GD28)	55200	2.66186023	0.565232943	25.0287355	92.1617164	219.725839	76.9925068
2841	(2004 HB)	53112	2.37395597	0.586462238	8.4332718	211.7561716	21.8582825	353.9602787
2842	(2004 HC)	55200	0.78917509	0.598818157	28.9759324	159.3338229	203.0185991	295.0489395
2843	(2004 HD)	55200	1.92525663	0.464080224	2.528919	343.1830891	215.0034425	53.0790295
2844	(2004 HE)	55200	1.77362752	0.608356799	9.4788214	79.3764407	208.2962673	130.7051235
2845	(2004 HL)	55200	1.55437826	0.346377007	3.4047272	170.281741	29.3685286	345.4918677
2846	(2004 HM)	55200	1.3319569	0.409933858	11.5816159	283.7128194	205.3875302	295.3493179
2847	(2004 HW)	55200	2.68767109	0.636954796	0.8328026	62.3903511	220.3804402	98.2526662
2848	(2004 HZ)	55200	1.30335304	0.442218371	4.2222983	97.1013343	204.3553869	254.4643736
2849	(2004 HA1)	53117	2.70352048	0.719307576	19.1032316	258.8344706	29.2211193	347.826788
2850	(2004 HO1)	55200	2.20665483	0.521398159	25.7649946	265.0966076	43.5129883	233.6565082
2851	(2004 HQ1)	55200	1.10924051	0.27062089	4.4190282	93.2671264	29.5557785	13.84424
2852	(2004 HC2)	55200	1.38706731	0.311667922	55.0242538	303.1702866	190.3627645	210.0578805
2853	(2004 HD2)	53118	2.31389975	0.833560313	15.430382	61.7625412	26.900366	14.4344506

#	Object	Epoch	a	e	i	w	Node	M
2854	(2004 HF12)	55200	2.13483695	0.65036899	13.3612806	104.9843561	22.6542442	311.6605344
2855	(2004 HG12)	53118	1.44033206	0.34412707	26.5014882	48.514639	208.22426	336.8032537
2856	(2004 HH20)	55200	1.78123596	0.42047485	4.1448368	198.888725	32.7114328	136.1718385
2857	(2004 HC33)	55200	1.76317361	0.428921857	11.2698939	20.1511696	212.4097909	148.9668613
2858	(2004 HH33)	55200	1.3716442	0.113473769	27.4745338	174.4264944	40.3835763	194.5497813
2859	(2004 HT38)	53121	1.73178556	0.376075261	13.1011855	151.9937075	40.1514585	9.666878
2860	(2004 HA39)	55200	2.14948205	0.53700233	36.1988819	67.3770966	204.1101362	273.4194597
2861	(2004 HB39)	55200	1.92886596	0.454471938	5.5051493	65.0221101	174.3202954	37.4587161
2862	(2004 HC39)	55200	1.81577925	0.500950811	14.6857729	224.1147192	56.1711549	96.0529464
2863	(2004 HW53)	55200	2.17803684	0.581315718	39.0933782	95.7689962	32.8109237	296.9398836
2864	(2004 HX53)	55200	1.19263741	0.333885675	3.5540676	241.6622258	64.5510352	79.6337473
2865	(2004 HR56)	53122	1.56217278	0.438942965	6.030404	87.8404128	41.1075498	41.2852596
2866	(2004 HS56)	53124	1.44114098	0.285396278	30.0385408	196.1349183	41.7572408	350.3530045
2867	(2004 HT59)	55200	0.97996397	0.223395396	11.1348809	112.1181609	214.7020364	226.4778647
2868	(2004 JA)	55200	1.35591202	0.628203727	29.6068784	54.2816686	56.9661305	248.9688669
2869	(2004 JB)	55200	2.40109193	0.516846695	13.2234264	141.728127	57.9578074	195.8074614
2870	(2004 JC)	53141	2.45457883	0.667343878	8.9360378	185.63818	107.9414407	347.8634844
2871	(2004 JR)	55200	1.89053777	0.646764335	45.4051053	139.4866646	209.6134334	32.7313973
2872	(2004 JN1)	55200	1.085394	0.175724529	1.4978463	1.9760152	144.0329812	61.971455
2873	(2004 JO1)	55200	1.02240563	0.474654884	21.5679281	286.2062253	69.8050234	91.6826703
2874	(2004 JP1)	55200	1.13389108	0.218818981	20.9132684	253.9838842	56.6557575	188.3032988
2875	(2004 JQ1)	55200	1.19376214	0.450184017	32.8289891	272.6013507	77.128429	47.3174707
2876	(2004 JR1)	55200	2.88463542	0.594636321	28.6360772	168.7776057	131.3191118	40.5542919
2877	(2004 JN2)	55200	1.06767643	0.60838903	19.7610138	179.8717078	228.3781051	221.9710969
2878	(2004 JO2)	55200	2.29081392	0.571016395	18.7039897	127.3026107	222.6604191	179.1213695
2879	(2004 JG6)	55200	0.63515707	0.531235362	18.9457491	352.9653905	37.0570408	264.2732777
2880	(2004 JB12)	55200	2.18859995	0.516991542	8.4362417	152.2297574	152.0801606	241.7937593
2881	(2004 JO12)	55200	1.38896399	0.254712679	21.6780367	16.6747491	231.8024473	152.2831496
2882	(2004 JP12)	53140	1.86195093	0.770402429	8.1679034	262.3997326	217.2680096	20.8285836
2883	(2004 JO20)	55200	1.46891171	0.432743907	10.2544602	68.1077236	234.5003614	31.9763426
2884	(2004 JU20)	53139	1.49374925	0.275094453	5.5937034	138.6003608	52.5561169	23.9977034
2885	(2004 JW20)	53141	1.31744944	0.340349556	25.1707367	252.5166877	53.4492131	322.1314516
2886	(2004 JW20)	55200	0.95277828	0.561452	14.7291881	207.4590871	235.2313544	122.1497784
2887	(2004 JX20)	55200	0.90119168	0.265718463	10.5249478	348.9831017	101.9849001	329.6235606
2888	(2004 KA)	55200	2.00471506	0.486138897	7.9318925	79.4620159	211.9531847	334.6060816
2889	(2004 KB)	55200	1.18693793	0.288477021	20.6574226	243.2393847	230.9950448	213.890283
2890	(2004 KT)	55200	1.85416467	0.663552308	43.6749744	238.4175455	268.0750736	115.7790334
2891	(2004 KZ)	53144	1.29010362	0.375416636	12.4246232	100.9326687	58.4951198	39.8593815
2892	(2004 KD1)	55200	1.71985232	0.33030417	10.1252389	9.7960078	271.5721812	175.2060038
2893	(2004 KE1)	55200	1.29933952	0.181022551	2.8842267	283.6019501	42.8189253	218.1769438
2894	(2004 KF1)	55200	2.11977771	0.440622532	9.3836431	5.0013428	242.1197608	291.6202407
2895	(2004 KG1)	55200	0.83032149	0.407306905	1.9104814	213.3833679	243.306676	264.4411572
2896	(2004 KN10)	55200	2.02599186	0.453801558	7.6353954	20.6254443	234.8308169	335.5728409
2897	(2004 KZ14)	55200	1.53691791	0.313155669	7.8862025	310.4982876	200.3207112	37.7398837
2898	(2004 KF15)	55200	1.82975572	0.354685805	11.0829497	34.4280367	229.1908736	88.4873079
2899	(2004 KH15)	55200	0.96118277	0.17020295	35.0689281	350.0526526	78.1274523	170.8897946
2900	(2004 KE17)	53156	2.78133433	0.619623191	26.9092423	175.2814487	68.9223027	0.5577295
2901	(2004 KF17)	55200	1.85010683	0.47674961	13.231297	212.4497671	70.0119528	70.114355
2902	(2004 KG17)	55200	1.5103825	0.321172967	0.4889743	149.224164	102.0576817	4.8294295
2903	(2004 KH17)	55200	0.71182046	0.498833332	22.1032694	340.6868129	79.1985546	318.1049112
2904	(2004 KK17)	55200	1.4669019	0.57555609	41.5661405	31.4928464	103.7280957	97.2960724
2905	(2004 LB)	55200	1.0506211	0.053212331	37.2876119	145.0027211	254.0503324	282.7034807
2906	(2004 LC)	55200	2.09847055	0.55389614	5.2364959	330.1177202	245.3139879	310.9282958
2907	(2004 LE)	55200	2.6460036	0.837261657	40.4436618	185.1685476	211.5328271	82.2953924
2908	(2004 LG)	55200	2.06577343	0.897242499	70.920472	164.6520841	256.9011677	291.5944947
2909	(2004 LH)	55200	1.76434679	0.327281305	39.5395741	341.318101	248.7201907	151.0398624
2910	(2004 LJ)	55200	1.08708174	0.461685003	18.2826657	256.0056734	246.8024828	35.4902865
2911	(2004 LK)	55200	2.09009285	0.512547895	7.8134503	229.8875837	76.0823727	288.6147465
2912	(2004 LV)	53167	1.66168191	0.62211558	2.307896	132.5382397	217.5164039	336.1282083
2913	(2004 LB1)	55200	1.28062116	0.245957216	22.9665496	125.7505428	82.9574666	335.081488
2914	(2004 LB2)	53169	1.33266558	0.570802926	6.8750257	106.2935789	261.5883796	323.2727921
2915	(2004 LC2)	55200	1.86510647	0.73457168	10.9655087	290.3555427	84.6033417	44.1305534
2916	(2004 LD2)	55200	2.84316897	0.557898864	10.9649434	42.2253567	237.5343777	52.7172677
2917	(2004 LO2)	55200	0.9148935	0.351294654	25.4536753	309.5198325	82.6640082	33.2918154
2918	(2004 LU3)	55200	2.17483419	0.531558905	9.8508031	224.1381305	113.9850717	244.191217

#	Object	Epoch	a	e	i	w	Node	M
2919	(2004 LV3)	55200	1.23133478	0.275771663	35.3386956	121.2901586	273.5222531	302.1195785
2920	(2004 LX5)	53169	1.30685196	0.213508864	13.5916858	172.6758445	83.3581888	4.3416739
2921	(2004 LY5)	53170	1.83456437	0.779383777	15.9892562	294.8491453	87.5624239	340.0710762
2922	(2004 LZ5)	55200	2.6030245	0.547888963	24.7333816	320.0757165	263.045703	131.8290696
2923	(2004 LA6)	55200	1.69214964	0.355518961	18.3141994	74.7026139	244.6319354	161.1405519
2924	(2004 LA10)	53174	2.49912232	0.582197517	1.0556199	140.4274418	140.0422605	356.9562537
2925	(2004 MC)	55200	2.44272323	0.587631952	2.4352897	203.2817466	91.505829	156.6195332
2926	(2004 MD)	55200	1.91782264	0.536443098	9.7487859	123.8755824	85.7509662	49.0700146
2927	(2004 MN1)	53173	1.44107058	0.415549078	30.6248271	248.7034684	84.5539798	330.2709097
2928	(2004 MO1)	53175	2.14030613	0.511672478	56.7057167	207.232376	83.6569598	352.7094306
2929	(2004 MP1)	53176	1.77756998	0.437781057	8.6431533	326.6861862	266.7185794	12.6651016
2930	(2004 MQ1)	55200	2.40505294	0.706996495	10.9673078	331.0075412	57.6213316	151.5969435
2931	(2004 MR1)	55200	1.52234697	0.373090697	1.7874708	220.9072244	88.1281357	324.0523444
2932	(2004 MS1)	55200	2.2740115	0.589893875	6.9654922	324.2653078	263.339176	231.3682944
2933	(2004 MV2)	53177	1.83442627	0.481497113	6.6656448	105.8416526	103.5350637	19.9808335
2934	(2004 MW2)	55200	1.14524445	0.638154923	35.1152593	50.1388535	96.185099	237.2944798
2935	(2004 MX2)	55200	2.77484234	0.712717671	18.3316161	241.7819768	118.1568337	59.5433382
2936	(2004 MO3)	55200	1.23301278	0.336338533	2.5533337	297.725721	252.737662	61.2963964
2937	(2004 MP3)	55200	2.60046067	0.519775414	15.754595	157.7975749	147.3064083	111.2614463
2938	(2004 MO4)	55200	1.69869042	0.38827562	2.2191813	188.4009187	106.4308338	169.7224831
2939	(2004 MB6)	55200	2.57203454	0.706277062	11.1324577	229.6927912	134.2658433	98.3171401
2940	(2004 MD6)	55200	0.95064927	0.562924051	29.3313246	231.3895367	263.910171	66.380526
2941	(2004 ME6)	53182	2.36483862	0.574756166	9.4430973	210.345796	112.2387778	346.1223393
2942	(2004 MQ6)	53185	1.81477547	0.645097827	35.3787121	256.3397467	106.0555879	338.6025113
2943	(2004 MO7)	55200	1.10497255	0.483882872	24.0813222	61.3673062	38.5856976	341.982863
2944	(2004 MP7)	55200	2.74231014	0.716432909	17.2020804	109.554878	97.8727774	87.2941824
2945	(2004 NF3)	55200	2.06326946	0.479589852	0.7854578	22.668043	270.1018459	304.9743561
2946	(2004 NU7)	53203	2.23296006	0.540653041	0.8349882	135.1805158	135.9205255	6.5567326
2947	(2004 NK8)	55200	1.32663099	0.280871179	15.9326728	302.5926271	290.0238056	243.0350423
2948	(2004 NM8)	55200	2.50730992	0.5152519	4.34116	223.1451477	50.0277341	141.5418857
2949	(2004 NC9)	55200	2.69265569	0.556585392	23.9332863	259.1970986	335.3370725	114.3521387
2950	(2004 OB)	55200	1.68102811	0.430192488	3.4411975	223.1829606	174.612937	133.134081
2951	(2004 OD4)	55200	2.03696476	0.514782039	4.3589434	336.0203683	294.702228	323.7266897
2952	(2004 OF6)	55200	2.18803881	0.413401035	8.9530873	262.8177593	39.1238693	246.6773975
2953	(2004 OW10)	55200	1.22368771	0.24918719	1.5036643	130.9759439	102.526611	53.3549908
2954	(2004 PJ)	55200	2.25414853	0.531941088	5.3948718	145.3774967	139.5069013	223.9296739
2955	(2004 PJ2)	55200	1.41799068	0.342030459	2.5831637	281.5986909	317.2313316	112.4051074
2956	(2004 PM2)	55200	2.57284937	0.524702661	12.5419801	200.7533392	153.5912624	105.4493162
2957	(2004 PZ19)	55200	2.04230065	0.550967378	6.8944707	223.2899064	138.7716845	294.3374574
2958	(2004 PE20)	55200	2.21215359	0.430589087	4.2286655	176.8325756	166.7996784	221.8091847
2959	(2004 PF20)	55200	1.56852799	0.294802753	17.4009608	334.9694998	318.0804986	284.6344699
2960	(2004 PG20)	55200	1.44062321	0.266728421	5.1995542	339.8535723	320.3082355	55.550287
2961	(2004 PX27)	55200	2.28063721	0.492527352	22.2280448	45.2981459	330.9138136	180.7008072
2962	(2004 PY27)	55200	2.30587959	0.438997442	4.7797083	273.3803805	13.2358463	205.3674059
2963	(2004 PS42)	53232	1.24148304	0.167065827	23.1787965	323.3206728	304.3856461	35.463688
2964	(2004 PU42)	55200	1.5742766	0.443850171	0.9893468	232.4933053	146.9108242	239.7676632
2965	(2004 PR92)	53233	1.13288418	0.340201938	13.0300633	100.1922632	321.6520031	300.6782226
2966	(2004 PS92)	55200	2.58828977	0.500888929	26.4186017	279.6704533	326.8659182	133.4595365
2967	(2004 PB97)	55200	1.23482828	0.162762073	10.9678077	160.5245468	140.7409756	349.6190999
2968	(2004 PD97)	55200	2.28652599	0.493648232	8.2099258	173.7070937	139.6874128	206.1659762
2969	(2004 QB)	55200	2.11215322	0.651264529	10.9743426	110.7405612	132.0965225	289.242116
2970	(2004 QF1)	55200	1.05049798	0.290094515	17.831897	173.9919328	332.9875835	225.072488
2971	(2004 QZ1)	55200	1.86524978	0.709524441	5.4921199	186.5694084	257.7322348	11.2616711
2972	(2004 QA2)	55200	2.12313698	0.515162125	8.3575529	159.4486816	132.8752026	274.7913467
2973	(2004 QX2)	53242	1.28650774	0.902743408	19.0785197	218.6107042	320.3768079	37.110584
2974	(2004 QY2)	55200	1.08397431	0.477266009	37.0257126	104.9518699	295.3420798	198.7163844
2975	(2004 QZ2)	55200	2.25894302	0.495138934	0.9704555	208.0974757	219.8336391	182.3886275
2976	(2004 QB3)	53241	0.95021121	0.416797902	14.3390614	232.1766017	327.2074409	88.2666234
2977	(2004 QD3)	55200	1.46661458	0.387794124	32.0467924	108.1795496	342.6967933	293.754162
2978	(2004 QR4)	53238	1.97134043	0.499578696	2.67079	208.9308753	149.2149641	351.1169371
2979	(2004 QN5)	55200	2.10868155	0.405076824	5.6189413	342.9143018	335.7829734	274.0908909
2980	(2004 QO5)	53240	1.98811654	0.498582134	9.22315	213.7577842	149.9660831	349.950327
2981	(2004 QJ7)	55200	1.44378533	0.329964339	14.5116239	63.4576357	25.6260939	308.8999188
2982	(2004 QG13)	53244	0.95199695	0.174418249	56.2250797	9.1122288	151.8606102	165.2723666
2983	(2004 QJ13)	53242	2.02990489	0.482142209	3.0262245	185.7706623	147.5961172	359.7645269

#	Object	Epoch	a	e	i	w	Node	M
2984	(2004 QD14)	55200	0.9423796	0.338051466	6.2536705	109.1976197	75.4124126	63.397032
2985	(2004 QF14)	55200	1.97640436	0.508821674	2.7644673	7.7626608	283.6721347	346.5943778
2986	(2004 QV16)	55200	1.7686029	0.573851281	28.5773231	49.0453542	196.3758007	123.665427
2987	(2004 QB17)	55200	2.28955776	0.504192012	4.8222456	148.7102559	289.1662518	151.4626197
2988	(2004 QC17)	55200	2.1532726	0.43789843	9.0281014	143.5526889	231.5938485	239.7496566
2989	(2004 QD17)	55200	1.73898713	0.328963403	12.3087451	171.3499431	230.1636776	92.3598889
2990	(2004 QD20)	55200	2.16716407	0.701224328	17.5593615	353.0956304	224.3427381	276.236432
2991	(2004 QG20)	55200	2.34152893	0.450027896	7.6364378	208.5152701	169.6278935	167.8572783
2992	(2004 QA22)	55200	0.95112019	0.121968708	0.5757917	28.6576275	175.0829155	37.988286
2993	(2004 QN22)	53245	2.48644766	0.591091537	7.1047758	187.6759513	163.1654049	356.9762207
2994	(2004 QT24)	55200	1.13253577	0.251923685	17.7466637	76.5226238	36.1734002	36.4160133
2995	(2004 QU24)	55200	3.32646266	0.614336767	23.3144549	270.6441087	189.7550635	299.3879032
2996	(2004 RK)	55200	1.38860246	0.300147253	18.1484415	264.3610352	178.8400119	24.1464408
2997	(2004 RV2)	55200	1.39065135	0.225618043	19.6459239	34.1837474	329.4525795	76.4538594
2998	(2004 RW2)	55200	1.42428901	0.304973908	8.3456031	46.0114161	334.2589596	29.3347357
2999	(2004 RJ9)	55200	2.79215951	0.624768853	22.7372082	341.5558552	300.9731898	63.0795734
3000	(2004 RK9)	55200	1.83735969	0.42587335	6.2273547	283.9914019	355.0158255	75.6560027
3001	(2004 RQ10)	55200	1.86455538	0.441850018	5.6872009	349.4248328	335.3133489	39.4167977
3002	(2004 RU10)	55200	0.90397424	0.656909307	15.9135325	65.1551617	119.1006566	253.1507357
3003	(2004 RV10)	55200	1.37713148	0.285537639	36.8686462	272.4262276	161.5785633	40.02828
3004	(2004 RW10)	55200	2.35568501	0.589819199	3.13342	69.7051349	207.7576564	185.2730747
3005	(2004 RX10)	55200	0.92012475	0.351130572	5.9559386	333.8527001	173.8283581	222.8757541
3006	(2004 RY10)	55200	1.67235995	0.621210744	15.4761249	283.2611139	165.91202	132.9631494
3007	(2004 RA11)	55200	1.82428296	0.399264816	39.3588793	276.4325032	169.7978763	7.8257302
3008	(2004 RB11)	55200	2.11137595	0.50654891	3.2027215	194.0350868	161.7553383	262.047453
3009	(2004 RC11)	55200	1.82506692	0.466354784	1.8597633	161.9423214	147.6592454	69.6760735
3010	(2004 RS25)	55200	2.12748338	0.479704327	6.6486614	145.3095666	179.0339066	266.3129924
3011	(2004 RC80)	53261	1.55379085	0.324462786	13.9548143	353.7073467	347.2452489	4.2199503
3012	(2004 RD84)	55200	1.82055993	0.415515754	24.2482275	100.2228741	331.3942707	11.4036088
3013	(2004 RE84)	55200	1.67346482	0.605393046	2.001956	131.4385496	322.3737561	129.3957137
3014	(2004 RF84)	55200	2.1645381	0.603505097	23.2568905	122.4712655	344.7558993	200.6918591
3015	(2004 RJ84)	55200	1.09477213	0.310702988	13.2361943	189.7125859	342.9969166	71.3726126
3016	(2004 RQ109)	55200	3.05715973	0.602808742	21.3459142	220.6539156	163.8578771	349.9387127
3017	(2004 RS109)	55200	2.33118912	0.495812566	33.9658651	192.7760585	173.2736138	172.6905818
3018	(2004 RU109)	55200	1.53222535	0.489134868	5.8486176	250.5438033	171.428223	261.755651
3019	(2004 RX109)	55200	2.20797819	0.810996202	29.5192975	36.5827544	201.3350418	246.1516337
3020	(2004 RY109)	55200	1.62774666	0.425151899	26.1249245	306.7673221	352.4468501	228.4442549
3021	(2004 RN111)	53262	1.66830311	0.393739683	12.6115032	331.3205866	349.8463854	12.2313447
3022	(2004 RO111)	55200	0.96119847	0.328817349	5.3347651	280.8642677	199.4241313	130.1860229
3023	(2004 RG164)	55200	1.60817574	0.377738446	1.2757058	147.8751129	176.0839818	228.5567515
3024	(2004 RV164)	55200	3.36638818	0.618103801	12.7017568	232.7062308	114.3791128	208.6930668
3025	(2004 RU164)	55200	2.40213848	0.579160649	2.5628276	2.7198298	326.2956687	158.3941476
3026	(2004 RW164)	55200	1.49021722	0.376829427	36.7757659	342.7821021	164.9748478	200.530398
3027	(2004 RX164)	55200	1.70605689	0.484890683	12.4869458	102.2671185	185.9352356	163.2253833
3028	(2004 RY164)	55200	1.72592531	0.314754918	35.874478	58.1360554	357.9099044	91.6536915
3029	(2004 RZ164)	55200	2.55376485	0.613359728	13.8657685	345.3401048	74.9550497	87.8360831
3030	(2004 RX165)	55200	2.32961475	0.509167737	7.8962224	330.8419895	28.7828983	173.564675
3031	(2004 RL251)	55200	2.53467994	0.58997825	1.3815825	56.8212188	279.014062	116.835426
3032	(2004 RN251)	55200	1.6535832	0.527230144	4.3906476	245.9059058	179.6159986	154.5925761
3033	(2004 RC252)	53265	1.30641076	0.12911849	19.326624	56.6143812	175.4223653	109.7646287
3034	(2004 RD252)	55200	2.09973119	0.600211434	10.4057565	174.6115591	288.2351908	238.4385478
3035	(2004 RQ252)	55200	1.12591488	0.388362344	7.7411117	82.9791484	25.4776631	87.4908453
3036	(2004 RU331)	55200	1.24144299	0.243992388	17.4641595	261.7453642	201.641623	221.2966106
3037	(2004 RN335)	55200	2.20993009	0.416564799	8.8387158	242.5666217	70.5934932	237.9509878
3038	(2004 RH340)	55200	1.29469036	0.381538379	26.1082118	335.3509989	51.5939069	225.738254
3039	(2004 SA)	53265	2.26354868	0.538432791	18.4235241	183.2229424	173.936103	359.3604613
3040	(2004 SR)	55200	1.14696376	0.160286367	8.6401073	297.4887905	354.86239	159.6218298
3041	(2004 SS)	55200	2.19490266	0.527217567	6.517493	352.8943181	1.5057875	227.3143341
3042	(2004 SX)	55200	1.76476362	0.327120673	15.284516	258.4881776	178.6541107	48.9011973
3043	(2004 SA1)	55200	1.18465295	0.150248515	17.1046673	327.7398849	355.9274826	62.3025286
3044	(2004 SB1)	55200	1.17959025	0.481676741	10.3465313	128.0867418	354.3933105	340.4566515
3045	(2004 ST2)	55200	0.9543341	0.186336589	22.0535262	226.8401402	356.7863076	1.8825842
3046	(2004 SY4)	55200	2.40891986	0.583141485	8.2064237	23.1691954	5.3688761	142.3546449
3047	(2004 ST9)	55200	2.24840119	0.435043733	12.2507787	59.6808184	195.2531699	278.1564297
3048	(2004 SZ19)	55200	1.79657764	0.302803517	26.2228805	171.1933568	170.3153525	85.7303789

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3049	(2004 SA20)	53272	2.41556327	0.71088446	2.846472	146.9198804	135.6718994	13.152958
3050	(2004 SB20)	55200	1.18292129	0.413108758	30.2797976	209.3343016	30.9494503	121.728563
3051	(2004 SD20)	55200	0.87506349	0.464952324	21.3342316	94.4061668	46.6312878	58.2229982
3052	(2004 SD26)	55200	2.03845327	0.773640161	4.8616201	359.4315295	117.7062581	265.5596752
3053	(2004 SE26)	53270	1.72998436	0.456100547	10.7366465	140.1265745	176.9857068	14.761483
3054	(2004 SR26)	55200	1.39844045	0.275052306	8.0355798	354.3537023	358.083422	73.3284347
3055	(2004 SS26)	53272	1.59564342	0.443116909	32.3336067	238.5170058	180.3787579	338.5683478
3056	(2004 ST26)	55200	1.75673368	0.673239481	7.3210411	266.2576861	359.2361874	117.4470813
3057	(2004 SU26)	53272	1.44268	0.54899208	14.1861794	83.9213824	184.1502708	32.9323111
3058	(2004 SV26)	55200	2.35039507	0.448268488	7.546973	37.4737387	32.4973946	147.0769317
3059	(2004 SW26)	53272	0.73778019	0.416197232	18.4180494	359.4923816	180.3636642	183.9634204
3060	(2004 SU55)	55200	1.37549876	0.236897321	1.153656	200.4029083	178.2869651	88.0964925
3061	(2004 SV55)	55200	1.75877768	0.658303566	41.1632914	280.7836975	344.7026036	114.116126
3062	(2004 SW55)	55200	1.4270629	0.333578415	8.7871115	352.7104781	75.1952024	359.6164343
3063	(2004 SB56)	55200	0.86572652	0.237944791	18.6967155	233.4358011	302.1069902	31.5129354
3064	(2004 SC56)	55200	0.76724539	0.428798093	4.7681808	322.5332121	202.2819788	167.2978031
3065	(2004 TN)	55200	1.42807892	0.436039234	14.0472471	159.8858324	17.1853436	256.4622405
3066	(2004 TA1)	55200	0.90795719	0.249908165	13.5124524	200.4852606	14.5653693	166.9922811
3067	(2004 TN1)	55200	2.74814872	0.697512804	8.4449666	233.4769833	214.0079092	36.608685
3068	(2004 TP1)	55200	1.29045732	0.389263058	7.4849067	87.6754727	30.1500561	152.8471552
3069	(2004 TE8)	55200	1.75345589	0.679282429	20.7353691	217.2746722	22.0843631	158.5313198
3070	(2004 TB10)	55200	1.1031877	0.093638923	22.5005771	149.7306909	12.8874685	43.57512
3071	(2004 TC10)	55200	1.12102705	0.407481006	14.1157689	135.9980132	16.5143102	48.5796818
3072	(2004 TD10)	55200	0.75085516	0.442914641	2.6213	136.6724228	48.4900481	226.4241427
3073	(2004 TE10)	55200	2.50802168	0.663407814	0.4978795	277.2959303	44.4290703	124.3271237
3074	(2004 TF10)	55200	1.42008821	0.336424697	8.9462319	347.8151749	297.4553431	83.8407944
3075	(2004 TG10)	55200	2.24132032	0.861932712	3.8094208	312.604669	209.6933382	173.4362523
3076	(2004 TH10)	55200	1.25045918	0.828920492	14.2987121	266.272871	271.7111054	190.601397
3077	(2004 TJ10)	53287	1.30660013	0.329353511	24.7162575	250.88589	195.6502551	322.1405324
3078	(2004 TK10)	55200	1.05807329	0.298959532	24.5988703	347.6661396	205.3498256	128.8688954
3079	(2004 TL10)	55200	2.66291277	0.652461306	9.1253249	322.7053755	12.1585502	82.1624571
3080	(2004 TU11)	55200	2.50183718	0.523529169	5.3032806	205.218825	207.962964	104.1704152
3081	(2004 TV11)	53291	2.26856232	0.519509824	7.4800418	329.7419557	19.462981	9.0515832
3082	(2004 TW11)	55200	1.38325579	0.275005433	10.6114237	43.0138208	18.3890971	52.5384412
3083	(2004 TR12)	55200	0.89511445	0.209646963	19.3554711	77.7136603	155.4351298	187.4469321
3084	(2004 TT12)	55200	2.49923	0.545260926	0.7232238	197.6487258	184.0121371	117.1233918
3085	(2004 TP13)	53289	0.97640702	0.161927386	36.5171357	138.6493941	12.6069928	238.0498568
3086	(2004 TQ13)	55200	2.67604861	0.516873335	10.4667638	163.3492505	233.2678437	73.4612934
3087	(2004 TR13)	55200	2.0183216	0.72930154	17.8648363	249.8028392	12.3587873	317.4941136
3088	(2004 TK14)	55200	1.62039123	0.235027575	10.2193916	71.9483236	357.7591756	160.2426893
3089	(2004 TB18)	55200	1.81518104	0.450820802	13.2081259	13.0453012	121.0618615	353.8886808
3090	(2004 TC18)	55200	1.33485715	0.36337334	8.3766601	103.3948902	206.5689022	174.8406871
3091	(2004 TD18)	55200	1.74574045	0.545538614	3.8850462	291.1416515	186.9419074	58.5421731
3092	(2004 TE18)	55200	2.11405255	0.407924326	8.9837405	324.6887111	35.2342204	259.0970043
3093	(2004 TL19)	55200	2.51980433	0.534624888	12.6245929	194.5867004	209.8754905	103.0654205
3094	(2004 TN20)	55200	0.94623773	0.258507227	14.0598679	56.5258135	203.0909031	335.8078398
3095	(2004 TO20)	55200	1.43894993	0.29566297	9.5569821	123.5974971	207.815792	36.7310189
3096	(2004 TP20)	55200	1.34377802	0.350927003	25.3746664	264.857871	213.5732843	74.6541988
3097	(2004 UB)	55200	1.3668215	0.618069825	6.3785907	36.7290668	243.0044132	131.5062506
3098	(2004 UE)	55200	2.61823683	0.649252611	15.0741523	215.5445967	227.1337718	69.481005
3099	(2004 UL)	55200	1.26644714	0.926843293	23.7236249	149.4527133	39.6803622	184.627014
3100	(2004 UR)	55200	1.55896028	0.405627769	2.4401445	56.6155769	28.6986242	217.0589973
3101	(2004 UH1)	55200	0.95422299	0.39690959	3.7129891	120.6465859	29.8442067	132.6865288
3102	(2004 UR1)	55200	2.17309877	0.618366177	4.0893206	72.4648302	251.7759723	239.4560737
3103	(2004 US1)	55200	1.28479788	0.451264622	21.4077431	74.2206667	223.4244589	249.6775699
3104	(2004 UT1)	55200	0.9645857	0.221273673	4.511658	294.4161635	211.8585374	84.6311139
3105	(2004 UU1)	55200	1.22624815	0.273680191	29.9608267	113.564901	217.8164785	335.2793184
3106	(2004 UV1)	55200	2.81805675	0.652079357	20.8189393	20.424292	76.4504514	17.1530655
3107	(2004 VB)	55200	1.45863557	0.409054925	10.8594444	71.4882936	52.4726343	296.7509309
3108	(2004 VC)	55200	1.13325879	0.258799258	39.1468425	94.2183201	194.1999744	166.4925055
3109	(2004 VP)	55200	1.65470298	0.429351451	11.7008196	70.9272182	45.8748393	121.7497686
3110	(2004 VV)	55200	2.07694088	0.604046593	52.4165632	354.497692	342.7835361	273.9595415
3111	(2004 VW)	53314	1.49966099	0.51372591	12.6802855	257.9626352	223.7277261	331.2643213
3112	(2004 VZ)	55200	0.94055453	0.244033743	16.2173858	297.0840465	225.819241	143.3823432
3113	(2004 VA1)	55200	1.05136777	0.512268216	14.9052248	20.8342266	250.7948436	4.1101949

#	Object	Epoch	a	e	i	w	Node	M
3114	(2004 VH1)	53317	1.55070276	0.471365488	32.7749129	88.6103744	43.4030885	324.3442012
3115	(2004 VJ1)	55200	0.94367639	0.16432284	1.2937685	332.3760784	233.5052467	70.3895691
3116	(2004 VY14)	53318	1.95353536	0.648046173	7.0526279	229.7206143	60.9240967	37.955879
3117	(2004 VZ14)	53317	1.53146106	0.525512916	4.5712978	280.2858139	41.6049667	29.4638144
3118	(2004 VA15)	55200	2.88433931	0.596337544	17.4165735	330.0868769	36.05307	23.6947135
3119	(2004 VB17)	55200	1.75360291	0.29632614	23.655232	200.3839132	232.8105914	69.5673874
3120	(2004 VC17)	55200	1.8961493	0.809967438	20.4833946	64.6244358	229.7459168	8.6165463
3121	(2004 VM24)	55200	1.13913435	0.429249417	2.9147208	276.8906577	231.5717305	34.2417528
3122	(2004 VS60)	55200	2.17706434	0.464565203	20.2724249	94.092455	239.4834199	236.8517443
3123	(2004 VT60)	55200	2.07562363	0.434177634	43.522355	247.3761099	57.6286523	303.9854054
3124	(2004 VZ60)	55200	2.46913416	0.576868094	3.056313	190.2137334	228.9168173	113.0554768
3125	(2004 VB61)	55200	2.29978384	0.495428304	9.2523356	344.0892306	59.83314	171.2373585
3126	(2004 VQ65)	55200	1.98239274	0.515507668	9.2596199	14.8599976	68.1070798	294.2409395
3127	(2004 WC1)	55200	0.85672004	0.171019095	10.3289785	179.2735447	54.8245118	351.3404556
3128	(2004 WH1)	55200	1.19790186	0.203209264	2.6587025	219.2104499	238.9634797	300.7148244
3129	(2004 WK1)	55200	1.08435861	0.72984267	34.4917702	223.0906394	51.8599173	245.9447684
3130	(2004 XG)	55200	0.83750788	0.298056826	1.201974	0.9619943	285.171988	348.1737411
3131	(2004 XJ)	55200	0.88720204	0.17036034	12.1939464	16.051236	253.3497645	184.9834869
3132	(2004 XK)	55200	1.55914832	0.398182377	11.1326554	220.2908453	251.3447868	203.7135466
3133	(2004 XO)	55200	1.03429092	0.096653762	25.9574586	71.057943	250.0244606	34.4882457
3134	(2004 XH3)	53343	1.919294	0.513178363	4.0236945	204.8617279	266.7198888	348.8162832
3135	(2004 XJ3)	55200	2.8758464	0.555169414	35.7365374	153.1906971	242.2948703	20.3893217
3136	(2004 XK3)	55200	1.22785975	0.260515808	1.4822301	304.6418502	57.9194243	330.3640046
3137	(2004 XK4)	55200	1.82770389	0.352507742	8.4531353	50.6513507	69.3859319	357.5935222
3138	(2004 XL4)	55200	1.86899059	0.362944733	16.7606197	164.2319828	241.2869863	9.3800098
3139	(2004 XD6)	55200	1.94574162	0.565493049	6.6752496	88.5463333	66.6969341	289.0790203
3140	(2004 XE6)	55200	1.86179695	0.351848691	31.1559778	45.3865954	82.850983	337.751286
3141	(2004 XK14)	55200	0.74861795	0.433847416	3.1001794	302.8638203	307.1416918	133.1907518
3142	(2004 XL14)	55200	0.759873	0.410089389	21.4599799	157.5265591	85.6572855	84.1202097
3143	(2004 XN14)	55200	0.93150375	0.266465128	10.7390047	115.6648079	120.9506556	104.358962
3144	(2004 XO14)	55200	2.67096931	0.554626259	25.9229654	276.262267	129.5913065	74.2468541
3145	(2004 XP14)	55200	1.05154997	0.158505509	32.9497986	273.6963785	281.0639911	159.1925941
3146	(2004 XG29)	55200	1.40941441	0.313104657	0.1546835	109.7909618	302.9197746	23.8525062
3147	(2004 XH29)	55200	1.38221985	0.503548943	22.6077941	334.0051606	232.1305267	337.3424719
3148	(2004 XJ29)	55200	1.99890439	0.524388492	4.6314042	107.315523	293.3338307	293.9459154
3149	(2004 XK29)	55200	2.39790939	0.645088923	7.8776018	338.7809214	35.3119015	142.4516745
3150	(2004 XL29)	55200	1.37540542	0.640917332	43.7933485	320.1593959	256.2451109	346.5275735
3151	(2004 XM29)	55200	2.13922797	0.633418564	2.5931017	59.4106355	100.2787215	203.5307995
3152	(2004 XN29)	55200	2.42437364	0.705418219	2.3797264	36.9484514	320.0539576	136.0852258
3153	(2004 XO29)	53354	1.23177345	0.670946369	21.5296175	144.9587561	80.8099429	290.6880897
3154	(2004 XJ35)	55200	2.11679855	0.390151079	7.6477349	7.5626598	72.8868798	235.2547072
3155	(2004 XK35)	55200	1.95244552	0.416485383	31.4837495	64.0231109	263.9459834	7.4318061
3156	(2004 XL35)	55200	1.355468	0.27836209	27.2972832	356.1248353	73.8003883	78.1095679
3157	(2004 XM35)	55200	1.83701313	0.300558664	5.3556599	322.8120134	119.1545054	5.0685013
3158	(2004 XO35)	53357	2.5779357	0.566454005	9.2480839	295.8396758	108.9977609	9.3206442
3159	(2004 XP35)	55200	2.00661823	0.537390451	9.3838026	319.6549839	80.4798783	291.5348577
3160	(2004 XN44)	55200	2.42247542	0.579487146	2.7652583	83.0320095	178.8424384	154.3459559
3161	(2004 XA45)	55200	1.54358708	0.500524043	34.918367	83.4020879	41.7975648	199.17087
3162	(2004 XB45)	55200	1.55022126	0.581573239	3.1602821	86.0704867	84.9872713	196.5965593
3163	(2004 XD50)	55200	1.82517702	0.377389215	20.6602907	63.6290107	106.1624049	332.5864491
3164	(2004 XJ50)	55200	2.23962235	0.510590216	23.3407192	283.6243654	102.2497548	198.427517
3165	(2004 XK50)	55200	1.4521744	0.689269724	38.2229588	103.8803586	94.2581835	282.8616743
3166	(2004 XN50)	55200	1.68216009	0.778209503	3.3189581	252.9829608	62.7897537	134.8343128
3167	(2004 XC51)	53355	2.07235806	0.736156649	39.9745117	284.7710658	252.37139	340.6545407
3168	(2004 XD51)	55200	1.24258117	0.240474795	6.7910057	54.2233467	83.6897036	199.9031177
3169	(2004 XY60)	55200	0.64025332	0.796717636	23.7538718	130.7963256	122.6719449	172.271626
3170	(2004 XO63)	55200	2.53496391	0.611867456	1.8980499	183.8582211	264.8834185	88.5958312
3171	(2004 XM130)	55200	2.32665564	0.465082414	28.2077502	189.875177	309.3265403	150.9222449
3172	(2004 YA)	53356	1.24271881	0.370781161	22.8553249	92.4138296	264.4325261	47.2006708
3173	(2004 YC)	55200	0.8683663	0.31325707	6.0666287	47.3144965	263.465778	189.2452978
3174	(2004 YD)	55200	0.8427439	0.24014045	12.0851009	7.7900004	265.5870259	353.5340687
3175	(2004 YE)	53358	2.28574151	0.546533015	1.4841864	5.4101014	69.4537368	3.0047766
3176	(2004 YQ)	53358	1.77795942	0.487315333	15.6989327	308.7268261	87.9063828	16.5201283
3177	(2004 YR)	55200	1.72357834	0.422727997	29.8301937	65.7185277	96.9302296	52.1573898
3178	(2004 YG1)	55200	1.00942814	0.158566974	19.8275748	293.9032258	271.8218349	255.6029159

#	Object	Epoch	a	e	i	w	Node	M
3179	(2004 YJ1)	53363	1.41043789	0.221075797	47.1678727	135.8615017	272.8430804	26.4908382
3180	(2004 YK1)	55200	1.88460583	0.415707833	8.6533643	77.0338736	96.6673149	308.3071228
3181	(2004 YA5)	55200	0.80882436	0.536202088	28.1484114	31.2222426	269.9377812	69.6232269
3182	(2004 YC5)	55200	1.92798737	0.617548384	11.4439746	26.8345101	334.7690144	340.6030476
3183	(2004 YD5)	55200	2.27481078	0.782702569	3.6090388	262.1036592	88.3982954	181.8846593
3184	(2004 YU5)	55200	2.30658761	0.454540501	24.2003293	141.4958481	304.3870572	155.7318171
3185	(2004 YY23)	55200	3.94614019	0.708344993	28.6094314	176.0358912	275.9787695	232.818936
3186	(2004 YZ23)	55200	3.42482009	0.676617529	56.0973935	300.9072046	253.0746233	269.8426741
3187	(2004 YR32)	55200	3.06086773	0.700758957	20.5251176	88.4966184	90.4300945	330.4884712
3188	(2005 AB)	55200	3.21972707	0.654874461	8.1565878	63.7662848	126.2588914	296.9476684
3189	(2005 AC)	55200	1.049806	0.517981058	46.8750657	285.613646	315.8222811	175.347197
3190	(2005 AD3)	55200	2.40889838	0.500339181	14.546551	277.1979711	294.575464	75.8524531
3191	(2005 AJ3)	55200	1.27473815	0.200835211	7.5397072	215.8635821	281.9431057	145.4983331
3192	(2005 AK3)	53384	2.16778535	0.579234805	1.5915813	226.493563	294.0704435	349.0586724
3193	(2005 AU3)	53379	1.2472306	0.474035118	3.7775744	266.6437222	105.1697575	43.3366444
3194	(2005 AV3)	55200	2.34354194	0.582147286	14.2548613	267.2829118	124.2269569	164.6277159
3195	(2005 AD13)	55200	1.94855956	0.755644012	12.3908294	262.8672311	103.4524008	320.3228629
3196	(2005 AH14)	55200	2.31167594	0.610513898	12.8730398	192.3509512	59.443816	125.4423628
3197	(2005 AN19)	55200	1.93451966	0.335112695	39.8454593	47.1739338	121.5182675	267.0452539
3198	(2005 AO19)	53385	1.68678496	0.34317664	3.2022836	352.6127009	113.573391	4.4964215
3199	(2005 AQ19)	55200	1.73658849	0.291267013	16.4820601	336.1851677	124.0088162	72.9340102
3200	(2005 AN26)	55200	2.32326057	0.635181421	4.9219079	207.9519341	176.0022699	175.0009912
3201	(2005 AV27)	55200	2.25482048	0.651402311	5.8538264	138.7544325	68.0382659	148.1046615
3202	(2005 AX28)	53387	2.15272914	0.654626159	7.5687191	72.8104079	113.5350167	346.2812841
3203	(2005 AY28)	55200	0.87226383	0.57009969	5.8968833	155.8066508	117.6510197	277.8175544
3204	(2005 AZ28)	53386	1.46703192	0.341714851	1.6049101	100.7472521	313.87321	32.4520205
3205	(2005 AT42)	55200	2.85027137	0.61595152	11.3036708	52.0404863	157.5802814	348.4545934
3206	(2005 BC)	55200	1.1896673	0.278064829	30.1240273	84.1569656	292.5094629	341.9006897
3207	(2005 BD)	55200	1.92244594	0.46861933	9.1603802	359.2319311	112.3151929	312.0512177
3208	(2005 BE)	55200	0.88379135	0.421123618	31.1895229	168.6794015	115.9991852	174.6252375
3209	(2005 BU)	55200	0.84660412	0.300800597	12.9704324	38.7189384	296.8757581	249.3441613
3210	(2005 BL1)	53387	1.51079389	0.319073807	21.7173158	195.1876341	297.7280236	352.3719169
3211	(2005 BM1)	53387	1.01160365	0.165579861	15.5020461	78.7183691	297.5438846	82.0829492
3212	(2005 BN1)	53390	1.78627925	0.55392114	6.7723485	107.4878368	300.8355341	21.3304144
3213	(2005 BO1)	55200	0.94892544	0.356035903	10.6741142	174.1346727	113.4042327	330.9541722
3214	(2005 BS1)	53388	1.96559898	0.566738191	2.645102	308.3357595	113.6930135	14.5174456
3215	(2005 BT1)	55200	1.33013489	0.713711666	63.6606939	32.8491755	304.5078698	150.1297422
3216	(2005 BU1)	53388	1.46698873	0.350877677	21.4769484	305.1430447	117.6310024	27.8796719
3217	(2005 BW1)	53388	2.54761051	0.871201288	62.2035383	274.4662693	342.5251058	352.3130333
3218	(2005 BY1)	55200	3.15320543	0.691272619	17.0314158	282.118516	298.057141	292.8798382
3219	(2005 BE2)	55200	2.01668746	0.623941578	6.5486701	162.0883502	92.7844493	205.5219444
3220	(2005 BY2)	55200	1.268692	0.330322439	7.2873019	130.1291337	74.5586966	116.7913373
3221	(2005 BG14)	55200	1.99258605	0.728254877	21.6490443	280.5005742	95.4197995	293.9082219
3222	(2005 BH14)	55200	1.16803997	0.65382233	25.0307567	50.0289295	303.601247	17.8291449
3223	(2005 BS27)	55200	1.11688423	0.385354335	16.7015502	48.7313368	324.1995343	137.5274883
3224	(2005 BG28)	55200	1.02577718	0.227143022	6.1322357	80.8438899	313.5234479	337.0838373
3225	(2005 CJ)	55200	1.74924772	0.525509535	1.0851619	81.5997705	358.1875869	63.5752168
3226	(2005 CK)	55200	1.1021431	0.089229671	17.2417397	160.5478412	313.9218261	106.477084
3227	(2005 CL)	55200	1.99014894	0.75206097	4.4175037	297.6951086	319.2379773	239.3975549
3228	(2005 CM)	53405	2.2759924	0.547585534	0.7967306	166.2561491	295.6502114	8.4447719
3229	(2005 CN)	55200	1.0152271	0.184992178	2.3027177	321.3924295	308.2711754	170.6523121
3230	(2005 CS6)	55200	2.61895683	0.547383271	23.5176449	267.9249313	314.9057794	29.3403244
3231	(2005 CA7)	55200	1.82929012	0.441415292	6.2295281	176.8824733	316.190101	355.7568735
3232	(2005 CL7)	55200	1.04879882	0.100521624	31.2831283	201.4973856	136.6321334	5.1074281
3233	(2005 CM7)	53407	1.71582287	0.632365246	4.9127196	270.5410292	136.6863839	22.7738658
3234	(2005 CP7)	53406	2.27017138	0.564226069	1.281842	350.0259133	127.1594799	4.6368864
3235	(2005 CQ7)	53407	1.8593232	0.498516589	7.8220043	312.0829161	138.1462321	14.8755897
3236	(2005 CV25)	55200	1.25696285	0.311058378	23.875931	357.3314757	326.7462522	346.3793835
3237	(2005 CZ36)	55200	2.23357913	0.577576031	16.1318886	139.2000104	116.9251224	121.5373807
3238	(2005 CC37)	55200	2.21201151	0.560941278	6.1129647	345.5377997	113.1736169	186.3677387
3239	(2005 CR37)	55200	1.90437008	0.468213968	26.0972891	209.5458804	335.6567035	295.7770477
3240	(2005 CP38)	53413	1.01871518	0.340898905	22.213875	61.6426027	322.2269448	82.4920922
3241	(2005 CU38)	53414	1.73941428	0.564713992	8.0090946	96.2543314	325.0656534	25.378386
3242	(2005 CV38)	55200	1.89001118	0.436665505	11.8867413	62.4237444	146.6576465	287.6549769
3243	(2005 CE41)	55200	1.78210144	0.517759172	2.783026	303.227916	143.3382326	37.2506613

#	Object	Epoch	a	e	i	w	Node	M
3244	(2005 CF41)	55200	1.64881742	0.58613685	15.8931925	208.6226758	132.2767531	243.701287
3245	(2005 CG41)	53413	1.05891608	0.353495127	25.2903309	238.1667232	137.8200968	87.6503088
3246	(2005 CN61)	55200	0.98947952	0.067883146	9.5452389	248.412453	146.7421465	86.6298628
3247	(2005 CU61)	53416	1.74145348	0.728772379	5.617485	85.2850639	308.6704964	24.650877
3248	(2005 CD69)	55200	1.08835678	0.187519427	2.7818306	264.4431455	336.6016971	34.5040077
3249	(2005 DD)	55200	1.93389097	0.568122732	7.325106	252.0037243	157.3904871	331.4670366
3250	(2005 DO)	55200	2.47583049	0.628489722	9.1893603	170.463079	53.2930553	71.2591113
3251	(2005 EA)	55200	1.30125592	0.639355797	14.0510116	298.7280073	347.019882	41.2827289
3252	(2005 EE)	55200	1.13040678	0.328159554	6.1729975	284.7213953	110.9640767	100.1867118
3253	(2005 EF)	55200	1.20727375	0.166595606	18.5944756	269.3800185	350.7974039	152.9331777
3254	(2005 EJ)	55200	1.44505738	0.154151533	12.4589063	92.1541191	33.5472573	310.5645999
3255	(2005 EY)	55200	2.52034843	0.889701396	17.2032173	185.6938928	62.3939186	59.5462402
3256	(2005 EZ)	55200	2.33855035	0.486808784	10.4925114	286.7710163	215.4211614	132.2515238
3257	(2005 EP1)	53433	0.89266375	0.770310351	16.3204879	328.0439766	344.392489	297.3955641
3258	(2005 ES1)	55200	1.35501063	0.29480082	1.8557222	315.2857502	164.6390506	47.9859086
3259	(2005 ET2)	53435	2.19117871	0.604578416	5.6758746	268.112803	333.8270155	334.3382361
3260	(2005 EU2)	55200	1.50787028	0.353494995	4.5790223	23.9641953	191.1253861	194.142806
3261	(2005 EZ29)	55200	1.87928213	0.42500003	6.8619639	21.9171094	158.5608263	311.8456117
3262	(2005 EB30)	53434	2.16710542	0.499610862	6.8623434	22.330643	167.9834913	353.4145905
3263	(2005 EM30)	55200	1.20336952	0.336999288	53.0814532	293.0820824	1.8319975	127.2648825
3264	(2005 EN30)	53436	1.6731198	0.2953071	20.3769105	196.3054305	344.2886746	352.6129345
3265	(2005 EO30)	53436	1.22571646	0.161178089	14.0163168	191.7908067	347.7367161	352.6480412
3266	(2005 EO33)	53440	1.96746129	0.572707776	4.6108895	158.4708623	289.7488874	22.138143
3267	(2005 EL70)	53438	2.27147188	0.925969442	16.1898615	220.4386278	167.5786855	12.0968701
3268	(2005 EM70)	53438	1.6013553	0.388011601	18.2818487	134.9296749	348.158739	19.7452957
3269	(2005 EN70)	53441	1.77918885	0.366871465	46.1454249	10.0945018	175.7278829	357.4370611
3270	(2005 EO70)	55200	3.14202517	0.651081973	24.5578673	208.6102516	4.228178	305.323368
3271	(2005 EQ70)	55200	2.40399843	0.474450066	6.2172792	102.6445948	70.6959767	107.4656751
3272	(2005 ER70)	55200	1.22451944	0.222888037	6.8333301	236.1901115	349.59252	164.3336024
3273	(2005 ES70)	55200	0.762921	0.386559176	20.83543	351.1956973	352.9382731	274.9026451
3274	(2005 ET70)	55200	2.12878933	0.828596263	5.5792133	326.8840873	82.946355	215.1784941
3275	(2005 EC71)	53440	2.16801715	0.495857478	38.8836439	1.4410845	170.4503251	359.4051124
3276	(2005 EG94)	55200	1.60443744	0.464842913	10.7545022	38.2303856	332.1327478	279.3587298
3277	(2005 EH94)	53440	1.2164414	0.267273631	6.2047291	255.0404832	348.9387806	311.5260531
3278	(2005 EI94)	55200	2.47285303	0.538631612	7.1560816	286.1603978	327.8933291	49.8329112
3279	(2005 EK94)	55200	1.97909947	0.478524968	14.1583624	154.7568261	103.1936398	232.6894598
3280	(2005 EQ95)	53440	1.66804183	0.52847428	2.395316	251.8916563	196.450947	26.5531825
3281	(2005 ER95)	55200	1.22315315	0.159155289	3.3366514	8.4746697	175.9322223	192.0006595
3282	(2005 ES95)	53440	2.00933163	0.533884232	7.5799785	51.0114675	167.8777681	346.2414109
3283	(2005 ET95)	55200	1.86159189	0.417028373	24.7988766	104.5885133	357.3899538	355.720186
3284	(2005 EU95)	53441	1.16782382	0.350701852	23.9534394	116.5623104	163.623763	298.5722272
3285	(2005 EV95)	53440	1.63936195	0.465311941	33.9769197	69.8131077	176.6948057	333.7609541
3286	(2005 EY95)	55200	1.08350119	0.538273372	3.1689549	341.904541	73.0920192	158.7418232
3287	(2005 EE169)	55200	2.24397847	0.561496096	1.3365144	50.8092054	160.048475	144.5438035
3288	(2005 EG169)	53440	1.42086244	0.466760916	11.7374774	91.0669084	169.9589147	322.1037503
3289	(2005 EJ169)	53443	2.01746374	0.570714183	6.6289433	120.1936726	359.0793552	14.489005
3290	(2005 EL169)	55200	1.44250235	0.166505038	11.8378427	172.107967	353.2829251	288.1192639
3291	(2005 EM169)	53442	2.84465976	0.734621266	10.9255121	115.0477433	348.2350651	9.0149228
3292	(2005 EW169)	55200	2.38936873	0.571412338	1.5316261	221.7688953	223.1909611	142.8905226
3293	(2005 EX169)	55200	1.23394385	0.110264463	14.8871186	352.2315614	174.1063883	189.252991
3294	(2005 EY169)	55200	1.30802557	0.2330085	20.8903142	227.4975331	346.9783033	49.0584159
3295	(2005 EZ169)	55200	1.31595382	0.214963642	2.7422671	353.4549097	175.9020967	69.1801337
3296	(2005 EY223)	55200	1.80180105	0.351986117	30.6416592	329.9774891	155.4709316	26.6549554
3297	(2005 EZ223)	55200	1.75478366	0.540440417	3.9350271	98.0550961	5.5980465	45.4262385
3298	(2005 ED224)	53444	1.90355951	0.65849875	31.8475692	277.2417786	170.5239682	19.6038092
3299	(2005 EE224)	55200	1.74510049	0.373082594	21.8265477	208.197891	20.0307664	1.9461951
3300	(2005 EJ225)	55200	1.7067622	0.572869392	8.8517191	290.2925012	342.3602904	3.7454813
3301	(2005 ED318)	55200	1.84778851	0.448161717	2.3915247	164.056783	82.1388935	300.6250643
3302	(2005 FA)	55200	2.17597092	0.625768663	4.0543191	62.2695586	174.4177152	165.6620246
3303	(2005 FC)	55200	0.91852291	0.273110115	12.9473258	310.7623013	0.2264077	53.9759538
3304	(2005 FD)	55200	1.46041033	0.393879045	11.3297639	270.8237801	13.4506423	195.5947331
3305	(2005 FE)	55200	2.32870721	0.489184575	6.0183995	177.0952599	22.815538	119.0794453
3306	(2005 FG)	55200	1.12172524	0.212720079	3.8839859	272.5359914	355.6939764	307.9998441
3307	(2005 FH)	55200	2.69622664	0.656686567	34.841276	317.8850764	144.1567425	51.0854696
3308	(2005 FJ)	53446	1.09020459	0.064974094	10.0407149	316.6803708	173.9169834	38.6580154

#	Object	Epoch	a	e	i	w	Node	M
3309	(2005 FK)	53448	1.53030827	0.412782431	5.9509324	78.925592	164.350804	332.311706
3310	(2005 FN)	55200	0.93304375	0.330205393	3.7484487	120.8668073	177.4097936	32.4197579
3311	(2005 FV2)	55200	2.16664245	0.723473806	19.5700177	42.4733751	32.217067	198.2454224
3312	(2005 FC3)	55200	1.97536383	0.586977569	9.8757591	87.6984643	158.4986978	229.344641
3313	(2005 FE3)	55200	2.11372708	0.53393131	13.1012783	144.9382063	90.6642264	184.9441214
3314	(2005 FL4)	55200	2.66796488	0.71527123	28.2590053	176.541052	66.9003556	21.52255
3315	(2005 FN4)	55200	2.66213514	0.764632791	29.3190757	105.6346561	190.629517	15.235973
3316	(2005 GG)	55200	2.04136608	0.659528351	34.7942111	335.2137706	106.4912136	241.3734734
3317	(2005 GH)	55200	2.1769396	0.477816289	20.2257849	306.2537069	189.6405175	194.8625031
3318	(2005 GJ)	55200	1.81201657	0.419080527	9.6319571	195.6883201	38.9595878	324.9264474
3319	(2005 GK)	55200	1.34202615	0.326230351	10.8751243	184.8496535	120.9296795	305.8441399
3320	(2005 GL)	55200	1.0561636	0.306324871	15.8984561	265.2819484	43.6891294	54.9140807
3321	(2005 GT)	53462	1.58254723	0.358789396	7.4351818	208.7144801	13.4691073	346.70316
3322	(2005 GU)	55200	1.55151782	0.614766469	25.0462465	275.6497341	27.0502573	129.1405708
3323	(2005 GL1)	55200	2.50982516	0.515455463	3.2162114	19.6627122	189.3803942	65.8084648
3324	(2005 GJ8)	55200	1.7665112	0.550973562	3.3980431	214.5498854	252.7749748	36.2743537
3325	(2005 GY8)	55200	2.04877391	0.672118436	2.8258836	103.2438751	179.9325773	197.2048473
3326	(2005 GL9)	55200	2.14081196	0.89634997	19.9743262	162.0889191	225.6899941	210.5937044
3327	(2005 GO21)	55200	0.75327953	0.340074501	24.9158902	156.5619774	272.7338093	303.0772264
3328	(2005 GP21)	55200	1.30823767	0.224589106	18.8053925	1.339325	10.0378199	239.1189225
3329	(2005 GQ21)	55200	1.42647587	0.21552084	47.0207169	143.5912076	203.2761432	159.297916
3330	(2005 GM22)	53467	1.96249738	0.454312306	20.9045508	336.5230489	194.0836661	8.8796421
3331	(2005 GN22)	55200	1.28484307	0.205657925	2.1989635	17.9529324	187.952011	87.0613815
3332	(2005 GO22)	55200	1.9149359	0.823884787	1.5879537	18.7430093	61.999355	304.1778894
3333	(2005 GP33)	53470	2.42954764	0.585245094	7.3942538	142.5421466	22.5042106	7.7051236
3334	(2005 GQ33)	53466	2.34153292	0.730689554	1.5534465	36.4568816	73.6796878	13.6349811
3335	(2005 GR33)	55200	0.77890747	0.38376587	28.0038447	334.5488499	22.7118544	188.6839453
3336	(2005 GB34)	55200	1.41298549	0.294913698	20.2832105	161.6014082	17.8520775	306.1078653
3337	(2005 GE59)	55200	2.1100311	0.601017392	16.0977395	242.7762907	194.9861548	259.6404816
3338	(2005 GO59)	55200	1.7953716	0.729894991	5.3365118	13.7116526	68.2455851	18.2747818
3339	(2005 GD60)	55200	1.3288631	0.373689427	9.8879239	99.9684872	199.1538443	338.2595934
3340	(2005 GE60)	55200	0.9589263	0.245905732	5.5683079	112.708881	229.9446781	254.8793656
3341	(2005 GF81)	55200	2.41985852	0.556190337	4.5130463	263.8756073	346.8332417	73.0580891
3342	(2005 GG81)	53471	2.11433652	0.500322848	3.6400772	184.5546197	21.4624015	358.766118
3343	(2005 GH81)	55200	1.94517135	0.544068176	11.7068784	118.4152593	19.7429931	283.7261839
3344	(2005 GX110)	53471	1.58455822	0.311893292	21.3262115	152.3379682	23.0091007	13.863472
3345	(2005 GY110)	55200	1.84901509	0.686182565	12.6346669	169.0531243	294.7035748	334.074786
3346	(2005 GZ110)	53474	1.66013547	0.431490087	10.9198584	60.7466837	193.4102788	339.0890914
3347	(2005 GW119)	55200	1.64052037	0.233311965	2.8811421	242.7736586	171.1426885	231.3588328
3348	(2005 GX119)	53472	1.76641359	0.430122692	1.0177515	338.4978578	190.3866629	12.8458646
3349	(2005 GA120)	53472	1.28683452	0.386466611	12.2675615	282.635159	197.7762871	40.767935
3350	(2005 GB120)	55200	0.79130198	0.394762176	9.1511435	243.6199994	161.0690523	20.3663626
3351	(2005 GC120)	55200	1.19304814	0.497552713	16.5359392	258.125746	68.0410958	152.0964771
3352	(2005 GP128)	55200	2.70641553	0.574614394	5.2893378	116.5007382	166.9059147	358.6361238
3353	(2005 GZ128)	55200	0.95131091	0.135541234	18.6538142	230.5410823	203.0993436	151.1778578
3354	(2005 GC141)	55200	1.48963796	0.199019642	28.2829469	40.5071542	186.0040773	207.561435
3355	(2005 GK141)	53476	2.78022522	0.662754796	14.0913049	218.1977157	34.2378501	352.7647631
3356	(2005 GM162)	55200	2.24474272	0.494228639	1.975881	257.6495673	3.5494791	127.4670158
3357	(2005 HB)	55200	2.70192556	0.606978812	9.2151472	125.3104805	96.7496626	19.3212295
3358	(2005 HF)	55200	2.18750525	0.555021456	3.8013047	143.154876	31.4866153	173.1144761
3359	(2005 HC3)	55200	1.98219465	0.374522191	32.0070204	107.2697029	94.8636858	249.9454836
3360	(2005 HM3)	55200	1.67839853	0.30985046	28.3190115	4.1175501	209.2671465	59.7332476
3361	(2005 HN3)	55200	0.85491197	0.335461278	7.8967113	6.0739604	59.5702034	98.7327568
3362	(2005 HB4)	55200	1.35483463	0.228039729	2.5271231	153.1771239	83.8593289	337.3149569
3363	(2005 HC4)	53493	1.81821641	0.961055581	8.3898069	308.979923	63.8073685	341.3752941
3364	(2005 HD4)	55200	1.44044782	0.262474421	22.4718037	349.5822799	224.7502205	254.4607438
3365	(2005 HA8)	55200	1.74042685	0.285987946	13.3909613	173.2770218	102.2018663	345.7241376
3366	(2005 JB)	55200	2.00349405	0.452832158	36.6677315	0.9661932	217.9533553	233.3454547
3367	(2005 JS1)	55200	2.21312821	0.417117803	25.3105135	158.9950315	71.3834036	148.1476831
3368	(2005 JT1)	55200	1.41817334	0.301588434	1.5623269	195.5187299	65.3585452	255.9660028
3369	(2005 JU1)	53494	2.34073077	0.683558535	6.0848927	266.4853484	35.7218964	344.9643399
3370	(2005 JV1)	55200	1.91224398	0.465476376	3.4315728	356.2449624	217.0816462	279.3162472
3371	(2005 JN3)	53496	2.15193583	0.506151559	9.1852796	48.9379734	206.0243956	344.8782106
3372	(2005 JO3)	53496	1.36471887	0.330668478	29.0202241	294.4394593	17.8256686	285.0635941
3373	(2005 JRS)	55200	1.15959407	0.154652997	31.0995336	246.5457402	49.3502891	210.781696

#	Object	Epoch	a	e	i	w	Node	M
3374	(2005 JF21)	55200	2.22429412	0.535671998	10.8668653	205.9946294	132.3476356	106.4189252
3375	(2005 JA22)	55200	1.53475212	0.298434023	13.2437561	252.07936	166.4085999	344.4308183
3376	(2005 JB22)	53499	1.063164	0.361952625	15.8820809	249.3860255	224.4888984	70.9414046
3377	(2005 JA45)	53500	2.77366955	0.626745995	22.4317096	188.9630176	50.2449822	358.313908
3378	(2005 JB46)	53500	1.33441481	0.218822565	14.0563365	179.2921908	48.7886203	1.14684
3379	(2005 JD46)	55200	2.64670606	0.78474533	19.0358016	49.8619381	49.1042115	44.0358756
3380	(2005 JE46)	55200	1.90402154	0.552581353	8.2601615	114.5024227	238.5652071	223.8955614
3381	(2005 JF46)	55200	2.69463089	0.535203021	35.9869536	197.4182464	80.532945	5.5268454
3382	(2005 JY80)	55200	2.63171332	0.5658176	18.3510296	211.9880195	118.2458975	2.3664873
3383	(2005 JP81)	53502	1.74045558	0.347868942	13.4731935	296.3298529	200.4620292	34.0551786
3384	(2005 JQ81)	53508	2.61627613	0.798138758	15.5418342	127.9676224	223.0371204	338.1036115
3385	(2005 JT81)	55200	2.8495846	0.583533764	8.5166824	21.9089329	242.0109051	340.4847531
3386	(2005 JU81)	55200	1.11638824	0.27787277	17.288141	72.5576791	56.3998766	48.0593482
3387	(2005 JJ91)	55200	2.79274234	0.596693481	24.4363955	206.1508142	67.026516	349.7054288
3388	(2005 JZ93)	55200	1.32005598	0.24077591	17.6509738	202.4000992	54.6001273	7.8002289
3389	(2005 JF108)	53504	1.94774855	0.792524478	34.1172591	23.8989375	69.2241531	36.8642894
3390	(2005 JT108)	53510	1.72168148	0.571574636	8.9355309	197.0810188	288.9144284	33.2783336
3391	(2005 JU108)	55200	2.12517993	0.461475876	6.5318133	106.1003959	188.0942891	161.6739143
3392	(2005 KA)	55200	0.84031546	0.214720891	2.9065882	181.228715	226.4296289	197.4506629
3393	(2005 KR)	55200	1.13898484	0.305992347	21.6294126	320.7360568	63.3987138	168.2516909
3394	(2005 KD7)	55200	1.16701358	0.55536409	40.0531069	137.4975686	240.1234409	167.4341922
3395	(2005 KP9)	55200	1.67194463	0.360430552	15.8693695	121.9025984	83.7379895	65.4504838
3396	(2005 KJ10)	53522	1.91985692	0.587895238	8.2857937	233.7092747	81.4015008	342.9734929
3397	(2005 LC)	55200	1.13347705	0.102194287	2.7999803	146.9872683	69.8577137	317.5212077
3398	(2005 LD)	55200	1.54638908	0.374252898	9.2996168	219.4537101	83.6072265	114.843109
3399	(2005 LW)	55200	1.46770546	0.640600889	3.1309159	354.6607753	138.1848217	243.4508133
3400	(2005 LM3)	55200	2.06452509	0.503986077	9.6376005	181.011458	71.5083294	196.4265388
3401	(2005 LO3)	53528	2.24250371	0.471072524	9.3837091	174.1762294	88.2719964	357.7222218
3402	(2005 LS3)	55200	1.48960577	0.268084032	34.8881959	123.5261323	85.2813197	220.5137441
3403	(2005 LU3)	55200	1.05702416	0.308407427	5.5799923	71.7937767	80.7710812	144.1189052
3404	(2005 LV3)	55200	2.20848092	0.438521287	7.3063574	13.4951839	250.8780174	143.0141583
3405	(2005 LW3)	55200	1.43126272	0.462379229	6.0638995	288.0157037	59.7620433	198.7380683
3406	(2005 LV7)	55200	2.42828304	0.557313575	8.9404682	354.5202868	309.0942714	65.8569641
3407	(2005 LG8)	55200	1.75471963	0.82745105	26.643095	193.6718954	211.3840672	291.0302799
3408	(2005 LH8)	55200	2.66311413	0.547408182	15.7054831	180.4997417	86.7110336	21.0370171
3409	(2005 LW19)	55200	2.14577953	0.455615753	9.5546066	359.5390089	273.155641	162.2764894
3410	(2005 LY19)	55200	1.60211585	0.239769646	30.0054887	120.1736645	338.4773535	256.9119588
3411	(2005 LV30)	53539	2.30843094	0.722285749	16.0411595	28.6530877	123.7660563	17.3142986
3412	(2005 LX36)	55200	1.02986752	0.57524316	32.9794733	239.0913566	252.8090651	193.8983179
3413	(2005 LA37)	55200	1.67807924	0.238817718	36.5847837	317.5498369	276.7578293	61.7510788
3414	(2005 LW39)	55200	1.98816486	0.715832157	28.4497918	275.0483217	251.6883447	242.027946
3415	(2005 LP40)	55200	1.96400932	0.547001173	23.6093973	186.5655925	148.7061571	214.5174306
3416	(2005 LQ40)	53540	1.79686548	0.469042472	10.5887153	70.8856326	250.3850107	340.159861
3417	(2005 LZ42)	55200	2.09824596	0.495960625	7.2787604	220.4441693	109.7207031	160.9828695
3418	(2005 MA)	55200	2.03642868	0.581717523	2.9513419	60.7521022	265.5304642	188.6158232
3419	(2005 MB)	55200	0.98526476	0.792759597	41.4037546	42.8071297	86.6725424	326.9558999
3420	(2005 MC)	55200	2.61651307	0.592610798	27.2688361	124.9892908	287.4271404	14.1471608
3421	(2005 MD)	55200	1.75814206	0.607529993	20.758377	202.4311017	189.0203331	291.1919743
3422	(2005 MR1)	55200	2.35691538	0.556854899	3.2856459	92.2051547	197.4268001	86.6280246
3423	(2005 MW1)	55200	2.86473714	0.56182783	6.36342	337.0542861	321.3345629	331.3425897
3424	(2005 MX1)	55200	2.1857241	0.536500419	6.8930239	139.8637223	195.5111264	125.9139907
3425	(2005 ME5)	53550	2.02501014	0.479196802	5.54498	185.0854608	98.7845156	357.5484768
3426	(2005 MF5)	55200	0.80375259	0.381738838	29.5142778	349.7340697	98.0844694	286.4719592
3427	(2005 MG5)	55200	2.14603836	0.458073815	6.7126309	46.3173942	261.2298273	145.534744
3428	(2005 MR5)	55200	0.85270699	0.295636088	27.7879762	190.5390946	263.6408285	71.3269488
3429	(2005 MW9)	55200	3.58538058	0.88701262	55.3025968	241.4918082	291.8111056	250.3701959
3430	(2005 ML13)	55200	1.14810414	0.246260168	6.8365237	220.6061344	140.7858803	183.4632388
3431	(2005 MM13)	55200	1.69478484	0.318298496	22.9987612	254.6732653	100.6344059	320.8613971
3432	(2005 MN13)	55200	1.65721435	0.336277105	22.8590847	142.7276461	104.9441365	54.263948
3433	(2005 MO13)	55200	0.86353541	0.410669179	6.3146493	250.1249997	176.6969112	98.9317682
3434	(2005 MP13)	55200	2.15084697	0.45127448	7.315426	182.3700739	114.892618	149.9538308
3435	(2005 NG)	53555	1.78327894	0.506018908	8.459513	305.8528382	276.231632	18.9578441
3436	(2005 NJ1)	55200	2.13343615	0.650406225	6.4698296	82.2095646	316.5526101	137.1456265
3437	(2005 NK1)	53555	1.54162201	0.736885018	36.4145084	3.7752733	113.6604252	153.8273835
3438	(2005 NL1)	55200	2.03588578	0.515245463	6.4385341	301.0290418	300.3134219	210.0716115

#	Object	Epoch	a	e	i	w	Node	M
3439	(2005 NP1)	55200	1.82725154	0.296701268	34.6886444	307.4463561	275.0740178	321.6545243
3440	(2005 NQ1)	55200	2.09479902	0.471686053	9.7130061	173.9105709	105.7862478	176.426868
3441	(2005 NZ6)	55200	1.83385616	0.864306914	8.4965329	48.1411662	39.5742884	255.1528935
3442	(2005 NB7)	55200	2.04424045	0.517622791	12.696991	348.1578266	199.2394511	216.2859661
3443	(2005 ND7)	55200	1.96393852	0.48177013	52.6007609	241.4769427	110.1537418	205.0993041
3444	(2005 NE7)	55200	2.04696285	0.647377728	9.515403	306.7882176	80.4795935	168.5494244
3445	(2005 NE21)	55200	0.78928921	0.496347378	10.6377685	194.6471006	289.8231603	298.4333261
3446	(2005 NX39)	53564	2.45623196	0.87657302	14.1475299	38.1459219	121.7545692	12.4097646
3447	(2005 NY39)	55200	2.25779031	0.485013899	2.9369933	342.8395223	314.6420839	113.612154
3448	(2005 NW44)	55200	0.77931569	0.483340259	6.0563651	0.6625078	114.5549109	8.3384403
3449	(2005 NX44)	55200	2.21563218	0.90692656	37.0684879	214.6118685	309.5349816	148.7072416
3450	(2005 NX55)	53563	1.52275631	0.587826616	26.1687162	277.259426	106.4267011	327.2386617
3451	(2005 NB56)	53566	1.64296384	0.473075872	6.7633317	114.1506966	112.3616976	25.6033467
3452	(2005 NG56)	55200	2.80312859	0.648871868	16.7248122	150.3833587	114.5245234	347.6511105
3453	(2005 ND63)	55200	1.35895093	0.301784204	8.5071809	313.1581988	289.44327	324.0734339
3454	(2005 NJ63)	55200	0.86925881	0.422276525	26.55007	1.7074587	120.8848098	356.8140935
3455	(2005 OW)	55200	2.66604036	0.601725697	1.6392027	62.2749182	271.7663259	1.011138
3456	(2005 OX)	53582	1.32984672	0.617340061	7.615585	100.1208486	323.9319354	317.3011238
3457	(2005 OU1)	55200	0.97599133	0.320114423	12.5231751	204.7577805	309.7761146	349.320224
3458	(2005 OV1)	55200	1.55583964	0.308275596	13.214897	235.5301613	128.1047684	73.6166588
3459	(2005 OX1)	55200	2.16658133	0.497767082	5.8609857	226.3156223	95.0393089	135.9083087
3460	(2005 OR2)	53582	2.03961406	0.552596848	3.6988385	335.2363718	277.0378736	144.4747386
3461	(2005 OT2)	53583	2.05181721	0.48003016	27.3064477	325.1097585	308.421121	10.9602126
3462	(2005 OU2)	55200	1.23491037	0.373499346	47.7750254	310.1605176	127.3885664	5.6698037
3463	(2005 OD3)	55200	2.3737047	0.603278753	16.214803	38.2224674	323.8846021	65.3997758
3464	(2005 OE3)	55200	1.56687688	0.428238181	25.3842384	58.3021291	321.1256643	62.2736229
3465	(2005 OF3)	55200	2.38333812	0.588189384	3.2826508	94.6447825	174.2982975	82.157677
3466	(2005 OG3)	55200	2.17218792	0.486914821	5.7493969	206.0478695	142.0217071	125.1080696
3467	(2005 OH3)	55200	1.23667753	0.168287575	4.7918237	185.406395	128.6721275	75.2192464
3468	(2005 OJ3)	55200	2.71059569	0.537755004	4.4403452	154.9717804	239.0201243	327.1647919
3469	(2005 OK3)	55200	2.14404922	0.502008778	7.7210125	189.3597821	134.807518	143.2413368
3470	(2005 PO)	55200	1.25227281	0.373132516	12.5169073	249.4065551	300.6115857	148.3742401
3471	(2005 PP)	55200	2.19147324	0.474244257	10.1362627	358.1356969	304.6465329	134.5617016
3472	(2005 PH2)	55200	1.42411374	0.605011121	5.7732955	343.4202524	96.5514971	159.6024223
3473	(2005 PJ2)	55200	1.19803191	0.659394924	17.4114811	128.7728703	326.5537541	70.811086
3474	(2005 PA5)	55200	1.32151211	0.226714413	15.3312162	148.9787075	133.1070378	347.0258817
3475	(2005 PX16)	55200	2.1809013	0.45431429	11.1039567	199.6482269	122.7649576	130.3065
3476	(2005 PY16)	55200	1.97581219	0.524748166	6.4166051	193.3939647	159.4255711	210.8124746
3477	(2005 PA17)	53596	2.31998175	0.57489568	2.5850666	231.3459617	126.4896509	351.2569047
3478	(2005 QC)	55200	1.80211085	0.772398018	13.7906439	12.1821138	79.9333843	270.3935506
3479	(2005 QL)	55200	2.44465758	0.503297105	10.7114672	290.5837951	105.1207987	24.2084847
3480	(2005 QA5)	55200	1.38993185	0.21119369	6.8017801	264.4821213	93.3902506	222.166776
3481	(2005 QB5)	55200	1.12279576	0.252183556	13.6879561	93.6158933	150.0272236	300.420675
3482	(2005 QC5)	55200	0.89331462	0.364652662	9.4516756	108.6306183	48.191085	238.7762915
3483	(2005 QS10)	55200	2.41952219	0.479814417	15.8031459	229.8629684	150.8483198	44.9397356
3484	(2005 QN11)	55200	2.17396717	0.403782218	5.6187383	134.9622617	223.8913166	123.0005992
3485	(2005 QO11)	55200	2.44971842	0.509102868	45.1986457	231.284737	163.1361682	30.3326504
3486	(2005 QP11)	55200	0.97562403	0.175881706	3.9569118	119.8287865	334.8750598	85.1652771
3487	(2005 QQ11)	55200	2.17044439	0.452659541	5.1603956	41.2766471	337.5454851	115.9362699
3488	(2005 QG30)	55200	1.55340523	0.21253437	7.0384468	351.1062723	341.1229033	92.7536264
3489	(2005 QQ30)	55200	1.75496576	0.544992828	11.2269173	173.5277377	67.9490188	344.6062611
3490	(2005 QK76)	53613	1.3992347	0.518272862	22.9012304	266.1286526	337.5902203	36.1190734
3491	(2005 QL76)	55200	2.21130578	0.441958111	5.9114468	54.0362508	328.0391071	103.44615
3492	(2005 QP87)	55200	1.23288738	0.175349898	0.267957	7.0352366	327.7405269	64.5061876
3493	(2005 QK87)	55200	0.9991643	0.302662078	33.8822272	54.3502289	155.0784174	219.448234
3494	(2005 QR87)	55200	2.13643274	0.426464448	8.6165509	345.97039	354.1333272	143.2188108
3495	(2005 QF88)	55200	2.25571614	0.459745535	7.0156757	176.3615681	180.301332	97.5775422
3496	(2005 QG88)	55200	1.72774418	0.493521503	11.3157998	273.1475078	344.8256043	3.118826
3497	(2005 QX151)	55200	2.29678018	0.472802848	7.9757386	36.3142752	359.9670629	72.0776623
3498	(2005 QY151)	55200	1.38106622	0.439539752	12.6438672	124.8134626	14.4319124	134.408622
3499	(2005 QZ151)	55200	1.93719429	0.580149788	4.8581598	62.9238249	20.9858546	190.0046725
3500	(2005 QR173)	55200	2.38808533	0.507813371	4.3528951	76.8437833	247.2307457	66.6969685
3501	(2005 QS176)	55200	2.21788902	0.475382196	8.5013447	201.4787586	174.9980308	102.8927988
3502	(2005 RA)	53616	2.59738965	0.666685234	4.4616508	80.2554857	321.900482	349.7165075
3503	(2005 RB)	55200	2.1955182	0.473874402	17.7772656	196.4243311	171.0282804	113.1435834

#	Object	Epoch	a	e	i	w	Node	M
3504	(2005 RJ)	53616	2.57842746	0.664462392	6.3405047	255.2093679	141.4917942	350.0292569
3505	(2005 RD1)	55200	2.63755145	0.508055367	10.3786465	8.5554033	279.7037984	27.119234
3506	(2005 RZ2)	53617	1.10574278	0.103188263	13.1274365	279.7855092	155.132589	275.7593783
3507	(2005 RA3)	55200	1.46156435	0.326375781	6.7599902	233.6485793	176.1616774	123.6609008
3508	(2005 RB3)	55200	0.87751504	0.39372392	36.0729941	320.4007011	165.8674761	348.5334873
3509	(2005 RJ3)	55200	2.29145284	0.531465805	8.8212916	12.0718617	345.9364505	85.4587093
3510	(2005 RK3)	55200	1.24761736	0.18540338	3.7254814	18.1735121	342.7515055	25.9639879
3511	(2005 RW3)	55200	2.10684252	0.642081946	2.7276475	218.9433202	49.3948121	165.9920519
3512	(2005 RX3)	53621	1.53426068	0.531789933	16.8837618	73.9658616	0.3190318	328.816699
3513	(2005 RP6)	55200	2.27655987	0.578673298	12.4862089	286.3575017	351.7647167	108.7265402
3514	(2005 RQ6)	55200	2.50619876	0.550987345	12.4809714	5.4468911	36.2326084	15.2258412
3515	(2005 RR6)	55200	2.97504791	0.695901655	6.9561551	58.8656461	28.271478	298.084066
3516	(2005 RV24)	55200	1.5055128	0.881642202	36.3720353	33.3001375	166.5025693	146.5926004
3517	(2005 RN33)	55200	1.73376866	0.256567414	7.1899264	300.0080968	100.753848	297.221272
3518	(2005 RO33)	55200	1.92564555	0.408457851	7.3117312	234.1216941	112.5901757	227.0250799
3519	(2005 RC34)	55200	2.0615071	0.514204816	10.7965433	35.8490325	291.1826055	169.0284446
3520	(2005 RD34)	55200	1.32642872	0.264527383	19.9203473	102.0250268	175.5978037	349.9257501
3521	(2005 SC)	53634	2.27128386	0.664571155	6.5355411	155.6702291	281.6709632	345.1195851
3522	(2005 SF)	55200	1.95336492	0.652772813	10.0658345	148.7021113	110.6547678	226.7799539
3523	(2005 SL)	53638	1.12646144	0.298756564	6.1778833	289.7473345	176.2837917	288.5360146
3524	(2005 SQ)	55200	1.65556344	0.574474616	1.1985279	293.6514994	318.4133655	49.5834261
3525	(2005 SO1)	55200	2.16893379	0.576887346	5.234742	315.5184366	358.958429	133.3982017
3526	(2005 SP1)	55200	2.37568933	0.668237587	5.9834701	109.7322956	180.1201742	73.7430401
3527	(2005 SQ1)	55200	1.73576063	0.411932792	6.4069166	161.5614506	177.0501511	322.1098987
3528	(2005 SR1)	55200	2.22188578	0.497244773	3.2419472	135.0623014	147.8537795	139.4005053
3529	(2005 SS1)	53639	1.98058578	0.513961741	2.871932	142.7209481	179.1579901	12.1411173
3530	(2005 ST1)	55200	1.45143735	0.370935819	20.2381406	80.580952	7.6528095	115.3079215
3531	(2005 SR4)	55200	2.18470148	0.474402432	6.834058	332.9743112	357.8148403	128.2467716
3532	(2005 SS4)	55200	1.45995934	0.751303942	14.5952808	192.1531911	28.7289824	207.1483797
3533	(2005 ST4)	55200	2.3588855	0.557375113	5.0216103	230.4149648	169.5128225	55.4844506
3534	(2005 SV4)	55200	2.39556154	0.596094904	7.9666186	140.0967278	174.575127	65.277031
3535	(2005 SW4)	55200	2.70454783	0.537634082	6.8524639	64.912455	10.3269773	328.6114723
3536	(2005 SX4)	55200	2.72982783	0.57417046	3.5386275	250.0981407	171.1021576	329.9475489
3537	(2005 SP9)	55200	0.86557124	0.623677016	27.7568281	228.0648491	354.8822824	186.8558982
3538	(2005 SQ9)	55200	1.44477582	0.356840655	4.0488308	280.2198975	6.9264585	207.3710419
3539	(2005 SW9)	53640	2.03472836	0.580155149	15.6451197	194.5387859	226.6062112	346.0733108
3540	(2005 SG19)	55200	2.62575404	0.588193627	24.9000211	249.3785273	13.0966431	48.9164529
3541	(2005 SH19)	55200	2.26995944	0.857996007	47.644088	158.2103341	18.5869617	37.3683783
3542	(2005 SJ19)	53643	1.56472503	0.381329567	18.4230952	311.9228904	10.7397119	20.0931463
3543	(2005 SM25)	55200	2.15208507	0.488644652	6.8095195	148.5443013	193.5056006	130.5321734
3544	(2005 SG26)	53645	2.48035044	0.594108261	5.9207792	207.8085317	184.9745675	354.9961357
3545	(2005 SH26)	55200	1.09778521	0.311468767	22.4175984	35.7956461	194.0237558	8.2684792
3546	(2005 SJ26)	55200	2.47729674	0.581832991	3.5496707	343.6875345	39.0454726	30.4678373
3547	(2005 SK26)	55200	1.78857331	0.465561994	2.1465514	229.0208595	172.3217235	269.6308368
3548	(2005 SY70)	53645	2.28168219	0.540176525	1.4392693	358.5852055	19.0968985	357.8059694
3549	(2005 SZ70)	55200	1.62186127	0.440825184	3.713829	118.0015583	198.9285139	42.128757
3550	(2005 SA71)	55200	1.61794258	0.367805759	20.2065853	283.6242895	44.3704598	50.4953113
3551	(2005 SB71)	55200	1.26372252	0.257333025	13.2097162	100.3469199	200.6665133	44.0913067
3552	(2005 SC71)	55200	1.9100975	0.382758609	32.3707524	117.7983605	196.6215421	256.7936318
3553	(2005 SD71)	55200	1.54351716	0.302664751	5.1753672	354.4852674	40.8529992	66.065832
3554	(2005 SE71)	55200	1.0695139	0.194597063	24.8288327	78.1620213	39.1585092	250.5750685
3555	(2005 TA)	55200	1.28077962	0.250151869	2.7815784	34.3390469	14.0247219	313.7008029
3556	(2005 TC)	53647	3.72755869	0.721159441	14.9605495	321.9684856	9.1479891	4.8312224
3557	(2005 TD)	53647	1.43999807	0.321525989	24.5533413	47.271286	11.8386771	335.6003619
3558	(2005 TE)	53645	1.75531326	0.579289758	6.5146659	270.5633688	13.0787043	26.2217517
3559	(2005 TF)	55200	1.96391591	0.455349497	3.6304007	43.3166999	26.5523805	177.0235428
3560	(2005 TG)	55200	2.66956595	0.53957299	11.0991828	190.8476128	230.9781525	350.8417148
3561	(2005 TL)	55200	2.3677966	0.456329113	5.120957	164.1120293	183.0485523	66.382554
3562	(2005 TM)	53647	0.84131167	0.416512563	5.2041768	151.8826079	8.67502	240.4487637
3563	(2005 TN)	55200	1.76555643	0.301217748	16.8537422	313.2479954	13.3594601	315.207742
3564	(2005 TP)	55200	2.27968001	0.587170135	7.8687487	353.6947963	86.4595964	66.5928815
3565	(2005 TR)	55200	1.55819373	0.303393861	11.83892	349.2007551	16.1025125	69.7191054
3566	(2005 TB15)	55200	1.81331662	0.755718483	7.2835568	138.9527785	9.6519649	214.7175769
3567	(2005 TE15)	55200	1.20429091	0.343545712	13.1327598	241.1530455	10.9602725	147.0888125
3568	(2005 TF15)	55200	2.29277215	0.654867194	15.9660303	7.0335911	76.2814176	65.0258145

#	Object	Epoch	a	e	i	w	Node	M
3569	(2005 TP15)	53646	1.34049756	0.278780925	14.8229895	143.2861194	187.1597685	21.695087
3570	(2005 TR15)	55200	2.11722693	0.431851259	3.9171832	59.1154394	214.2560638	195.9959563
3571	(2005 TS15)	55200	1.25970589	0.352838441	34.0063805	106.0033149	16.252169	288.5995352
3572	(2005 TE45)	55200	1.83760715	0.399007287	1.3636925	200.2154232	204.3501093	240.1995209
3573	(2005 TF45)	55200	1.15612449	0.074044146	6.8063871	37.2744902	197.1888505	286.5538843
3574	(2005 TG45)	55200	0.68142445	0.37235616	23.3305405	230.4003848	273.4824455	51.3524532
3575	(2005 TH45)	53650	1.28963224	0.488665494	5.5499464	263.021752	13.3650767	41.4259713
3576	(2005 TO45)	55200	2.56934216	0.518552423	17.0111515	6.1075548	15.8461953	7.9273037
3577	(2005 TP45)	55200	1.55119645	0.270811746	21.3775822	10.5255595	13.7837475	63.3162284
3578	(2005 TQ45)	55200	0.82718521	0.233179423	25.6249625	185.7952855	14.926031	40.837638
3579	(2005 TR45)	55200	2.17044757	0.508539948	7.3646343	125.7350454	179.9481846	132.7408262
3580	(2005 TS45)	55200	2.35398264	0.454036212	2.9953026	70.0120989	301.1824095	64.5391316
3581	(2005 TU45)	55200	1.97352421	0.496098236	28.5437767	76.86288	120.2555863	224.6521545
3582	(2005 TD49)	55200	2.68784935	0.622691226	0.0932238	191.8104975	196.3536975	344.5210575
3583	(2005 TE49)	53652	0.94924874	0.376947567	5.0055771	304.9339986	195.2553063	276.7190717
3584	(2005 TF49)	55200	1.0419167	0.025442334	24.5505111	302.3726044	25.7582262	59.3340022
3585	(2005 TF50)	55200	2.27004066	0.871198148	10.7227326	159.799574	0.7295509	60.8338903
3586	(2005 TG50)	55200	0.92382306	0.133803848	2.426644	199.5960836	346.0345973	111.9991906
3587	(2005 TH50)	53655	0.83735026	0.225697686	0.7331318	18.1296278	196.8356329	155.0045235
3588	(2005 TK50)	53652	2.27084175	0.6905772	6.156624	74.4997701	16.4322045	347.0164761
3589	(2005 TR50)	55200	1.61451009	0.455480044	34.0626836	49.2070544	29.5007341	358.5856673
3590	(2005 TU50)	55200	1.42603179	0.596268523	12.4290209	259.4299957	22.4286644	205.1796389
3591	(2005 TC51)	55200	1.0079152	0.305620985	5.6703947	288.0479295	199.4271537	352.272518
3592	(2005 TV51)	55200	2.02839582	0.514089907	10.5002036	23.2486937	19.6548699	160.0476449
3593	(2005 TY51)	55200	2.59429321	0.560200293	24.4010596	3.4566672	79.6352733	1.394776
3594	(2005 TZ51)	55200	2.12614009	0.429082796	10.8307238	127.4191487	280.4736346	130.2236459
3595	(2005 TM173)	53653	2.87611496	0.675368838	1.2821365	172.5183575	241.4353178	354.0438292
3596	(2005 UB)	55200	1.89582647	0.738452123	27.7104451	3.0947927	272.1617814	239.2218093
3597	(2005 UC)	55200	2.29061746	0.513254746	5.6361693	150.2406084	218.1271709	77.9084634
3598	(2005 UE)	55200	2.38208065	0.462549984	5.381984	185.1341743	233.4307549	43.4545704
3599	(2005 UF)	55200	1.67434826	0.514428651	7.277698	244.4084689	209.8888966	317.4014218
3600	(2005 UG)	55200	2.80915378	0.598730536	3.0198258	1.8554293	49.49256	318.1017359
3601	(2005 UH)	55200	1.62597002	0.38109091	6.3247852	307.5196441	36.4825545	30.8427697
3602	(2005 UL)	55200	1.87946052	0.717437453	7.8548304	213.329997	291.619803	191.3890645
3603	(2005 UN)	55200	1.40614693	0.277845768	7.4182751	357.0300916	27.8398863	189.1840352
3604	(2005 UO)	55200	1.35076495	0.582117917	7.7078703	258.4040963	19.3139046	285.386201
3605	(2005 UQ)	53670	2.24019279	0.546281305	8.7027964	336.9031071	25.6132874	8.1998531
3606	(2005 UR)	53669	2.25897558	0.882425853	6.9495562	140.4724032	20.0438189	347.0139638
3607	(2005 UA1)	55200	2.12002692	0.615677686	0.4327219	71.6568595	257.1973516	143.2204054
3608	(2005 UC1)	53668	1.47149734	0.245736127	20.9004864	89.6082193	210.4379993	62.2171642
3609	(2005 UE1)	55200	0.89294749	0.170308657	5.6527537	139.6489269	32.63978	222.3053563
3610	(2005 UF1)	55200	2.18536356	0.431649146	13.5794327	1.2693056	49.5696999	99.7981002
3611	(2005 UG1)	53669	1.94020978	0.426767774	29.3374281	187.0512608	207.0207563	359.5643885
3612	(2005 UH1)	53670	1.75911957	0.630038884	12.9402083	226.6754079	32.8084018	61.0596214
3613	(2005 UJ1)	55200	1.99320754	0.401535685	10.869368	274.3870015	68.2496282	197.4632087
3614	(2005 UK1)	55200	2.49931397	0.695453569	0.7884537	345.8413615	180.4714219	332.1687519
3615	(2005 UL1)	55200	1.36741791	0.230880649	18.383379	37.7954083	35.7376553	200.0052668
3616	(2005 UC3)	53671	2.17701157	0.544885171	0.251686	329.8964667	26.9674646	9.8906688
3617	(2005 UE3)	55200	2.25052526	0.448388146	9.7672834	330.6008029	6.5912899	99.318326
3618	(2005 UF3)	55200	1.85911825	0.386330746	27.3431391	221.0752721	208.1038813	217.7482771
3619	(2005 UG3)	53670	2.02283339	0.506156205	8.9098241	200.4061097	212.4328697	354.7574733
3620	(2005 UH3)	55200	1.72623662	0.546741761	44.7554706	309.124791	53.3941195	319.5510364
3621	(2005 UJ3)	55200	1.27604176	0.475975274	13.9473612	128.2558069	36.5423226	251.0078169
3622	(2005 UW3)	55200	1.18853028	0.135748632	18.0655215	169.519303	213.6799563	92.3726449
3623	(2005 UF5)	53674	2.56671697	0.559224984	0.264447	22.5215708	4.5648526	1.8036575
3624	(2005 UG5)	55200	1.05577739	0.189722423	2.8655439	112.1623956	35.7604789	213.4520674
3625	(2005 UH5)	55200	1.24549738	0.185332355	21.3833476	28.1785026	34.1879389	345.5536453
3626	(2005 UK5)	53673	1.42754119	0.089869044	2.6718146	307.7790876	19.7420407	58.3578677
3627	(2005 UL5)	55200	0.93728603	0.569695349	14.2936423	127.5926705	58.976578	126.609342
3628	(2005 UM5)	55200	1.21141752	0.552370066	3.2236935	170.5770598	84.9067545	141.3085201
3629	(2005 UN5)	55200	1.79950821	0.421358117	5.7979448	334.8967645	37.3210035	274.0764646
3630	(2005 UO5)	55200	1.16037426	0.150089369	19.6786423	76.318761	50.8109614	44.2577045
3631	(2005 UW5)	55200	1.39721909	0.395125472	2.9407189	63.0478687	35.2013086	163.5930171
3632	(2005 UX5)	55200	1.76227244	0.57773588	19.6638975	264.6147793	217.8075176	254.9488049
3633	(2005 UY5)	55200	2.22786621	0.416865031	7.1349835	261.9131887	56.6552943	146.1355069

#	Object	Epoch	a	e	i	w	Node	M
3634	(2005 UZ5)	53674	1.40946356	0.24241096	19.4727507	28.8473675	36.440282	343.5564628
3635	(2005 UA6)	55200	2.41242028	0.620795774	5.7205645	310.2696722	37.6408305	51.6780557
3636	(2005 UH6)	55200	1.00066371	0.632326588	2.6484331	200.2481532	19.2079535	140.5843305
3637	(2005 UJ6)	55200	1.06869532	0.416230671	18.9962916	131.311054	42.4336991	183.8585434
3638	(2005 UL6)	53679	2.53552659	0.614286621	0.282625	84.1880567	272.0658241	9.6838158
3639	(2005 US6)	53672	1.59483488	0.402358804	1.7319257	293.2170884	40.0241512	26.8220211
3640	(2005 UU6)	53675	2.47604742	0.503297499	16.8573089	190.0961859	212.7426691	358.2798522
3641	(2005 UV6)	55200	2.13121479	0.534877353	1.8933668	202.6118141	213.9871271	118.3179811
3642	(2005 UW6)	55200	2.04174348	0.743099161	0.9479589	180.1161282	335.0725375	134.5598866
3643	(2005 UY6)	55200	2.25102199	0.872400405	12.2833121	180.6792571	343.6358079	56.4857137
3644	(2005 UF7)	53674	2.48982369	0.588144025	0.9202597	197.6843316	209.9496067	357.8412131
3645	(2005 UP64)	55200	2.68622968	0.579969785	23.7593167	280.7041584	202.5170872	309.4841115
3646	(2005 UQ64)	55200	1.60853668	0.368434146	5.1866101	172.5475213	202.4466633	27.0440352
3647	(2005 UR64)	55200	1.6976259	0.374285071	4.6641802	42.2972626	33.7793529	302.4328099
3648	(2005 US64)	55200	1.13983603	0.143802585	37.0862913	310.6141406	36.1979863	194.7478135
3649	(2005 UT64)	55200	1.82262564	0.521993444	10.4967974	327.2470737	161.6754371	217.6412675
3650	(2005 UV64)	55200	0.95818214	0.11617046	5.4163678	313.9374401	216.0792369	42.0948485
3651	(2005 UW64)	55200	2.28056361	0.474666005	5.4478966	112.3913303	210.7666299	113.536429
3652	(2005 UN157)	55200	2.52142173	0.853570261	44.5694397	209.8948541	21.8226265	55.6289077
3653	(2005 UO157)	55200	2.8151233	0.598395215	3.6468637	167.6368897	309.6394374	296.8078151
3654	(2005 UJ159)	55200	3.34930553	0.830921573	35.3694133	95.1813198	81.1050909	235.3363821
3655	(2005 VA)	55200	2.47634249	0.568963651	1.8211787	169.0212031	217.7076809	27.8786008
3656	(2005 VC)	55200	2.08120914	0.596499693	4.4739444	289.8734862	228.3010046	58.1507134
3657	(2005 VE)	55200	1.06367828	0.275157768	22.416456	31.6969778	223.4229235	62.832424
3658	(2005 VF)	53677	2.06163889	0.508268166	4.9415479	214.8339147	213.9212685	351.1917148
3659	(2005 VN)	55200	2.072875	0.5509299	10.8075691	141.8167192	219.414062	151.3991073
3660	(2005 VO)	53678	2.43019143	0.663566558	0.5290867	251.6076734	207.1840962	349.9113119
3661	(2005 VP)	53678	2.32213295	0.586020981	5.4793084	134.2661464	222.958253	10.1739458
3662	(2005 VQ)	55200	1.12552995	0.488638232	19.12973	184.1607295	54.4826164	316.5480991
3663	(2005 VR)	55200	1.92674513	0.522204377	34.9381948	270.8135593	50.0890872	231.9968297
3664	(2005 VS)	55200	1.37617794	0.287800347	10.139695	149.3710497	228.0092448	223.5782106
3665	(2005 VH1)	55200	2.96287621	0.617751072	6.9892373	35.5840996	45.3282402	287.8937341
3666	(2005 VJ1)	55200	2.64049921	0.526088575	11.2764681	76.7671033	330.97679	345.3450999
3667	(2005 VK1)	55200	0.74141168	0.426523589	24.5452869	358.5288775	223.7365032	2.6303876
3668	(2005 VL1)	55200	0.8908492	0.225166346	0.2497669	228.7248154	37.4782944	99.4207581
3669	(2005 VM1)	53682	1.47785337	0.195455131	30.4892965	342.3877319	45.7570717	13.1869303
3670	(2005 VN1)	53679	1.3932186	0.323317809	13.2186778	137.6178578	220.4972967	23.004306
3671	(2005 VY1)	55200	1.67364116	0.41062007	6.6063361	18.1408389	45.0688726	324.2824622
3672	(2005 VA2)	53679	1.20707848	0.318324926	5.730227	356.2799806	232.3318422	163.5838336
3673	(2005 VC2)	55200	2.76539475	0.587331751	36.7771904	166.8480519	222.0963022	325.2299966
3674	(2005 VT2)	55200	2.3248722	0.565007304	6.143144	155.0578406	200.4959959	73.1070321
3675	(2005 VY3)	55200	1.67172381	0.344793117	30.2184465	255.099971	49.1084745	36.1013957
3676	(2005 VZ3)	55200	2.16093597	0.478866261	27.9808594	46.2659386	48.8645084	92.3667846
3677	(2005 VN5)	55200	0.94461964	0.233061394	2.0862816	115.052764	49.3427627	96.025764
3678	(2005 VO5)	55200	2.00937681	0.560707659	14.271627	241.6388155	101.2489533	184.6555329
3679	(2005 VS5)	53684	1.96050882	0.46330784	18.1571488	302.2016606	38.7739047	22.745546
3680	(2005 VT5)	55200	1.44995477	0.261232345	19.5345229	319.3270923	221.8868485	23.9119568
3681	(2005 VB7)	55200	1.80207973	0.347319769	32.5755935	212.2778192	241.5109973	232.292784
3682	(2005 VD7)	55200	2.31870956	0.56119509	5.1972684	354.9362396	27.9207129	70.1004933
3683	(2005 VE7)	55200	2.33036641	0.716419541	7.6436112	14.0168811	287.6719265	83.4985065
3684	(2005 VG7)	55200	1.9986745	0.548974417	2.8801926	327.4619953	39.5916275	179.504516
3685	(2005 VR7)	55200	1.08281342	0.287214539	25.2483751	101.0388919	254.9172678	299.7406055
3686	(2005 VT7)	55200	1.74092966	0.448403858	6.7957016	345.4767438	34.0422897	299.8001353
3687	(2005 VY17)	55200	1.98440063	0.4391832	25.4350353	66.1740022	79.3520624	135.9662377
3688	(2005 VO118)	53678	2.55104578	0.577399816	4.4661996	342.3881367	50.0062343	2.5197855
3689	(2005 VP118)	55200	2.09573436	0.703036899	19.2884355	123.1698751	111.1727156	113.8333268
3690	(2005 WA)	55200	1.1217628	0.227748106	8.1614876	113.2223677	227.9234574	221.7842093
3691	(2005 WC)	55200	1.07726857	0.443451575	1.7440933	133.6770679	31.708149	191.703956
3692	(2005 WD)	53697	2.26033207	0.555350935	25.9512808	160.6142531	227.8058913	8.320802
3693	(2005 WE)	55200	1.15144318	0.251518625	12.3626387	22.6237254	290.0051478	196.8895369
3694	(2005 WF)	55200	1.77669533	0.420888099	21.3260781	356.8660798	58.1153601	267.5768096
3695	(2005 WX)	55200	1.59709005	0.376039785	4.3991483	180.3548247	242.0197427	14.5110921
3696	(2005 WY)	55200	1.79117115	0.476046688	0.5724081	222.632734	236.135331	245.4478121
3697	(2005 WZ)	55200	2.41384913	0.556897538	7.679219	359.6095583	38.3624072	40.1929605
3698	(2005 WA1)	55200	2.00647527	0.585818751	10.9401992	241.4950297	247.4524676	143.292448

#	Object	Epoch	a	e	i	w	Node	M
3699	(2005 WB1)	55200	1.26390891	0.355510031	22.8892411	265.6630848	61.4858312	18.0438284
3700	(2005 WC1)	55200	1.40072356	0.486554203	19.9844863	256.6216798	265.1101755	131.3496666
3701	(2005 WD1)	55200	2.19986164	0.44248293	43.0564063	285.9178806	52.392461	147.5022133
3702	(2005 WY1)	53697	2.30619291	0.576881818	13.8728748	33.2321151	51.341838	354.1067686
3703	(2005 WC2)	55200	2.48406033	0.513741819	6.9076326	221.4337446	236.6296004	4.881339
3704	(2005 WR2)	55200	1.53174484	0.546356749	7.8574472	49.4650632	282.4518462	96.5332885
3705	(2005 WM3)	55200	2.67334942	0.620116629	1.226635	190.2384531	240.2092607	338.007294
3706	(2005 WN3)	53699	2.48948368	0.726068102	0.4849075	255.5882259	242.7555885	349.0985701
3707	(2005 WO3)	53701	1.57403833	0.355278656	22.9539833	312.4700961	64.2181443	23.5986203
3708	(2005 WP3)	53701	2.29168028	0.553832065	4.7768495	353.4351585	62.8695584	2.2325015
3709	(2005 WQ3)	53701	1.74121947	0.626277204	11.066634	269.4455162	63.1123753	24.2299233
3710	(2005 WR3)	53703	1.29715374	0.294082376	34.2498174	265.7104938	65.9714838	62.7377336
3711	(2005 WS3)	55200	0.67169986	0.575064423	23.0301192	176.0532748	69.4280962	357.7157083
3712	(2005 WF4)	55200	1.50964904	0.232874827	15.959409	21.6279723	58.402861	64.021645
3713	(2005 WG4)	53702	2.43788115	0.601889261	10.344917	309.3148855	63.6626358	11.6887239
3714	(2005 WH4)	55200	2.2238666	0.491276786	22.1726524	17.3272398	72.9789955	76.2351827
3715	(2005 WK4)	55200	1.01176982	0.237315415	9.8329219	74.3138594	138.2900209	245.9797372
3716	(2005 WR54)	55200	1.9429343	0.407761919	14.7804231	325.9757323	73.4810324	200.6448666
3717	(2005 WE55)	55200	1.7423227	0.398014548	23.5283099	87.4449758	63.2341489	239.1363791
3718	(2005 WF55)	55200	1.50151984	0.324960462	2.2596001	181.9521077	244.8648311	81.3242584
3719	(2005 WY55)	55200	2.48503052	0.721836723	7.2737282	285.9355058	248.4383969	355.8089893
3720	(2005 WZ55)	55200	1.72003042	0.390225415	8.4958718	165.2139011	249.555991	298.6945999
3721	(2005 WK56)	55200	1.62132146	0.392640433	5.3469082	321.5511314	76.5075346	5.8541346
3722	(2005 WF57)	55200	2.65094414	0.580162033	10.7662513	305.0821846	61.6332042	353.4691534
3723	(2005 WG57)	55200	1.79561746	0.49205806	0.4231097	212.4261586	161.4446083	269.9134016
3724	(2005 WH57)	55200	1.70797955	0.368441728	40.4483103	125.351363	262.1514758	326.8262264
3725	(2005 WP57)	55200	1.85732832	0.410376056	10.5634969	183.5752928	252.4796734	221.5281424
3726	(2005 XA)	55200	2.55020223	0.656717931	5.4967001	45.6946405	69.3489401	351.5383934
3727	(2005 XC)	55200	2.28498786	0.560403001	3.6384814	189.3064185	215.7404081	72.4667452
3728	(2005 XN)	53708	1.75628602	0.417614903	21.139028	335.9449249	71.8869552	9.5510225
3729	(2005 XX)	55200	2.30045711	0.592310126	1.0012248	226.2493822	237.1390528	53.1431649
3730	(2005 XY)	55200	2.15708344	0.411688151	39.6333094	81.1140769	279.5992271	155.302324
3731	(2005 XB1)	55200	1.13099736	0.418860636	8.7005525	232.7930369	73.4604523	219.8026687
3732	(2005 XC1)	53711	2.51263413	0.594399825	13.016753	349.6813272	79.2385291	1.4434233
3733	(2005 XD1)	55200	1.62041599	0.306539075	18.2874637	198.6559178	287.4266357	334.0823308
3734	(2005 XE1)	55200	1.44938363	0.151605442	29.1294773	314.7273668	83.2272351	167.4379957
3735	(2005 XK4)	53709	1.35248751	0.604983622	8.6231529	69.6293812	250.6298204	39.3706313
3736	(2005 XL4)	55200	2.84582577	0.566436886	10.3534418	8.1598375	74.3240398	305.6438849
3737	(2005 XM4)	55200	1.30388897	0.064189751	34.1443714	345.1676048	81.9093301	262.8869642
3738	(2005 XN4)	55200	1.87760689	0.581292874	58.0363615	93.5966415	70.7598728	179.530532
3739	(2005 XO4)	53714	2.29105008	0.5960111	2.3657154	179.680222	297.0034475	350.1272178
3740	(2005 XW4)	53715	1.03863154	0.710288272	18.2653745	145.378865	73.1921149	300.142836
3741	(2005 XX4)	53711	1.75148343	0.452606495	22.275176	149.0707114	251.9908064	11.7291467
3742	(2005 XY4)	55200	1.0562475	0.598484819	1.9075163	143.3266049	163.1488538	327.2692381
3743	(2005 XZ7)	53713	0.96807507	0.320441521	32.6510671	238.5651198	75.7022904	87.195098
3744	(2005 XA8)	55200	1.41812509	0.436876659	5.3463205	111.1622624	254.1916735	177.7707821
3745	(2005 XJ8)	55200	1.93182423	0.62038739	23.5883705	67.1743323	116.1167887	153.5437776
3746	(2005 XK8)	55200	1.61112299	0.253762245	25.4557916	173.4290335	277.8185667	353.7060796
3747	(2005 XN27)	53713	2.40851488	0.63456197	0.2955934	169.4790933	215.5931405	10.1191121
3748	(2005 XO66)	55200	1.66466434	0.443517404	1.2054176	188.2722468	297.2412387	303.8306852
3749	(2005 XP66)	55200	2.79534332	0.582631277	2.9219605	274.1173839	215.225594	298.076614
3750	(2005 XT77)	55200	0.84067942	0.266351925	17.2461753	149.9008054	84.8728308	314.7997978
3751	(2005 XV77)	55200	0.78418978	0.414140081	16.8504148	9.2194075	282.3142321	68.8236921
3752	(2005 XW77)	55200	1.61556209	0.355642598	16.4398518	99.9773143	268.8298153	32.5943942
3753	(2005 XX77)	55200	1.52608284	0.345750504	5.7125844	329.8309048	79.2748523	71.1666039
3754	(2005 XL80)	55200	1.72559609	0.487931329	10.8964092	143.452156	53.4333607	237.8272834
3755	(2005 YC)	55200	3.23438011	0.612246148	24.2113313	123.4673735	296.5306129	256.5932881
3756	(2005 YD)	53727	1.65234779	0.425571978	4.7824646	314.1451774	90.7012136	17.6218367
3757	(2005 YK)	55200	1.06108198	0.30772717	5.6218165	80.3960201	269.6756869	313.4689391
3758	(2005 YS)	55200	0.71100321	0.550467054	19.5804953	327.8561935	288.6705695	94.6127189
3759	(2005 YY1)	55200	1.16335321	0.25192797	8.3401757	279.0944535	84.1039018	135.3912704
3760	(2005 YN3)	55200	1.77090568	0.363144837	36.432525	85.7162776	277.031314	298.6361828
3761	(2005 YO3)	55200	0.76004711	0.372275384	12.7907148	20.0248928	274.3810333	165.7087585
3762	(2005 YR3)	55200	0.81765214	0.272690695	3.6019248	222.9719863	70.9313555	306.0277821
3763	(2005 YU3)	55200	2.55336278	0.840706968	3.0873465	340.9032199	2.7237853	11.4969757

#	Object	Epoch	a	e	i	w	Node	M
3764	(2005 YS8)	55200	1.6963632	0.529288535	17.3651177	298.2118825	56.4520916	324.7043783
3765	(2005 YT8)	55200	2.54015019	0.592641496	10.9249712	165.7138653	283.1211308	355.8864476
3766	(2005 YU8)	53733	2.01470841	0.543219785	4.0359069	237.2953289	279.3006086	343.7406648
3767	(2005 YY36)	55200	1.89431054	0.394972378	4.6099938	214.066659	275.2786792	189.1689299
3768	(2005 YA37)	55200	1.28010946	0.227949047	2.2401293	88.6895835	93.101189	213.815729
3769	(2005 YP55)	55200	2.28223453	0.436592379	6.9311525	267.5641485	105.3429913	98.2902741
3770	(2005 YT55)	55200	2.25158184	0.46018787	2.3001857	11.6177373	141.3960111	50.7422861
3771	(2005 YU55)	55200	1.14057467	0.42881829	0.5082792	268.83784	39.4819939	224.3437107
3772	(2005 YV55)	55200	1.95820995	0.392375905	5.9302723	308.2364394	126.6814988	178.7715884
3773	(2005 YW93)	55200	2.6370394	0.551035145	13.5367443	140.5883033	183.7855999	348.8966354
3774	(2005 YY93)	55200	2.58633991	0.883175419	23.3545405	309.9639316	298.7389724	327.5884315
3775	(2005 YQ96)	55200	0.74379171	0.333270214	22.2152107	339.9832564	282.7292581	293.2462841
3776	(2005 YL128)	55200	1.35521127	0.447439434	18.4348448	309.17007	280.9253568	118.6370643
3777	(2005 YN128)	53736	1.66156849	0.443055925	2.5776921	117.5954256	284.9898448	21.2057063
3778	(2005 YO128)	55200	0.82113039	0.296460756	15.5866005	328.3628252	281.7857811	10.3038998
3779	(2005 YT128)	55200	2.61554037	0.570935751	27.2219424	115.1974788	294.1413637	355.4653332
3780	(2005 YU128)	55200	0.77187823	0.321458401	7.7322956	189.9330626	100.7262284	129.2198202
3781	(2005 YV128)	55200	0.9229911	0.512375191	14.1384839	191.7459222	127.7879828	268.4334359
3782	(2005 YX128)	55200	2.17875474	0.73247167	4.4326966	315.3518919	260.5974845	68.906753
3783	(2005 YS165)	55200	1.96792962	0.444531287	33.9948906	10.2398778	86.1615744	150.37458
3784	(2005 YO180)	55200	1.48029374	0.447957777	5.772126	87.5859537	7.8399002	107.8313009
3785	(2005 YP180)	55200	1.37287454	0.61718655	4.1127133	92.1682232	289.1794925	206.3988752
3786	(2006 AD)	55200	1.04833097	0.489927342	54.9854447	87.3005064	120.4069046	173.7695327
3787	(2006 AN)	55200	1.09347993	0.219991317	7.4034355	273.4380902	277.7172899	115.2549001
3788	(2006 AW)	55200	2.21715749	0.596404493	10.4110464	112.3282685	282.1541546	90.5833743
3789	(2006 AX)	55200	1.29008451	0.141749748	11.6810576	232.8304623	280.5618595	225.8568913
3790	(2006 AR2)	55200	1.48827308	0.417860344	29.9634425	287.3953523	278.264657	14.6635813
3791	(2006 AT2)	55200	2.70983314	0.598291268	21.1556145	39.1722736	144.165295	293.425326
3792	(2006 AV2)	55200	2.40838212	0.479886147	6.0144849	184.5736909	304.2943602	18.4190646
3793	(2006 AB3)	53741	1.71556105	0.411114006	8.4223149	189.2963854	285.1174226	356.9796651
3794	(2006 AC3)	53744	2.3328186	0.571394953	3.0483773	322.6895415	108.7347538	8.9165013
3795	(2006 AL3)	55200	1.3772496	0.12663332	13.6652886	144.7160776	319.0726958	177.6747527
3796	(2006 AP3)	55200	1.72275216	0.372875406	10.0005094	172.2774022	289.7944724	277.8712972
3797	(2006 AQ3)	55200	2.44870506	0.63659205	22.824468	269.0019577	290.7529052	354.5994948
3798	(2006 AR3)	55200	2.46308894	0.639768916	4.7538897	40.160318	12.8963785	24.2974876
3799	(2006 AS3)	55200	1.33775555	0.32985841	13.4100206	245.4164404	289.2451961	172.4431946
3800	(2006 AT3)	53744	2.27839521	0.531020234	14.7546571	178.7443693	288.2322232	0.4279388
3801	(2006 AU3)	55200	2.26494393	0.564960077	1.4161569	0.0470627	114.7068891	59.1766731
3802	(2006 AF4)	53749	2.29720956	0.550749904	6.711185	132.2328986	296.1443744	11.8886672
3803	(2006 AG4)	55200	2.54426464	0.527386835	5.6250573	339.6189511	107.5108386	358.0386342
3804	(2006 AH4)	53743	1.9211827	0.471005848	0.6647106	208.6701675	279.3147764	353.5674418
3805	(2006 AJ4)	55200	1.46500861	0.117279276	18.4250213	256.2129474	115.0679506	181.5939174
3806	(2006 AK4)	53748	2.64856776	0.631584689	8.5165743	114.8741594	298.6405915	13.1335994
3807	(2006 AL4)	53744	2.49713589	0.583481072	2.7603183	27.9910354	103.1944775	355.5840536
3808	(2006 AM4)	55200	0.98181091	0.64910073	4.1285129	139.6890204	123.285423	308.7094203
3809	(2006 AN4)	55200	2.008394	0.470091785	5.983301	52.8738792	119.8767047	124.5947905
3810	(2006 AO4)	55200	2.63029438	0.582394968	24.4016133	50.3118823	318.6265643	47.7046245
3811	(2006 AK8)	55200	1.1572854	0.122552969	28.9475678	72.0541615	118.6091824	13.0448712
3812	(2006 AL8)	55200	3.33971482	0.886981756	35.8939339	65.5919429	312.271821	243.8851332
3813	(2006 AM8)	55200	1.86939423	0.794040725	10.2020452	188.3394802	57.1976688	172.4357989
3814	(2006 AN8)	53745	1.5216334	0.23893626	3.5132545	158.6767033	303.8125703	4.7733218
3815	(2006 AW44)	55200	2.48511536	0.562712744	8.6572699	0.8953652	108.6573053	4.4118501
3816	(2006 AX44)	55200	1.57764888	0.302082935	2.2925988	22.6038769	111.1703156	351.3717717
3817	(2006 BA)	55200	1.12034575	0.217847197	3.5473202	250.6580982	298.6661859	73.2270594
3818	(2006 BC)	53757	1.41782919	0.830343878	18.1801337	281.2225717	321.1182823	334.9071437
3819	(2006 BF)	55200	1.47152144	0.390497233	5.0033163	322.1901136	101.8562083	102.4005071
3820	(2006 BG)	55200	1.6825384	0.732167109	4.812296	341.0257067	281.1172662	251.1020376
3821	(2006 BH)	55200	3.24105406	0.643679973	31.070009	249.178286	306.1704947	231.3874907
3822	(2006 BN6)	55200	2.5494229	0.707244871	17.9286819	336.5333053	251.2385475	330.9370242
3823	(2006 BO6)	55200	2.87633073	0.644704654	9.4273734	152.5257761	294.9532306	298.0066553
3824	(2006 BP6)	55200	2.38962159	0.598431622	18.7444145	87.9640914	107.6284375	6.2548719
3825	(2006 BQ6)	55200	1.47190644	0.404658466	12.9932409	304.6296039	307.7616128	356.110885
3826	(2006 BO7)	55200	1.43534141	0.40314622	0.3424344	247.5077324	295.2215443	80.5736462
3827	(2006 BP7)	55200	2.3327525	0.581944855	4.8427033	111.2277873	326.2265129	48.2635664
3828	(2006 BQ7)	53760	1.34687685	0.257279909	4.9717399	155.0675296	302.1442534	16.3140621

#	Object	Epoch	a	e	i	w	Node	M
3829	(2006 BT7)	55200	1.52214178	0.632927232	16.1453248	342.430654	298.6750365	274.6354379
3830	(2006 BU7)	55200	1.17510599	0.10732096	8.2282824	348.4368294	121.8904439	45.5700728
3831	(2006 BW7)	53760	1.48140308	0.411246072	1.3760184	116.936913	305.4896247	26.8939092
3832	(2006 BX7)	55200	1.13969947	0.28223649	4.9016154	77.468552	313.3536737	147.2742076
3833	(2006 BY7)	55200	1.8742567	0.455231798	3.1771678	162.3292408	302.7522052	200.1389423
3834	(2006 BZ7)	55200	1.48980554	0.366189215	68.4136363	188.7244145	262.9679685	55.0711541
3835	(2006 BA8)	53762	1.83449894	0.367844174	9.2754024	177.3125862	305.026194	2.6002807
3836	(2006 BB8)	55200	1.64048905	0.441114663	7.3478641	313.0477218	121.5500214	335.4053089
3837	(2006 BC8)	55200	1.22762873	0.432026621	6.9032392	91.0954272	303.4024298	6.1485551
3838	(2006 BL8)	55200	1.12249889	0.298267582	12.2140175	92.2757136	121.2275062	57.8090095
3839	(2006 BM8)	55200	1.54235772	0.530194261	5.1964114	281.8154559	121.8192519	47.5270373
3840	(2006 BY8)	53760	2.4792808	0.677138196	2.6810608	121.8342806	301.2816036	10.3549478
3841	(2006 BA9)	55200	0.91258781	0.366058911	8.3151358	25.5488352	305.9398353	319.952127
3842	(2006 BB9)	53762	2.68009595	0.67239368	6.6975301	132.2932134	302.3459588	8.6569821
3843	(2006 BN26)	53764	1.99734722	0.509456526	1.57918	266.4129439	178.5806331	13.2006373
3844	(2006 BX26)	53763	2.22996462	0.485747036	6.7716746	326.1752292	121.9928969	12.6724386
3845	(2006 BB27)	55200	1.36199991	0.245657808	27.154608	144.5886275	132.2333421	59.126751
3846	(2006 BV39)	55200	1.14423305	0.270939309	0.7373408	74.8947987	127.0156393	31.4630715
3847	(2006 BW39)	55200	1.97747487	0.536495087	5.7886975	227.2623373	308.0481602	136.8656712
3848	(2006 BX39)	55200	1.89834	0.636619709	14.3371182	79.2204731	140.3932161	159.1584234
3849	(2006 BD55)	53763	1.39882903	0.35761846	12.8869212	286.3852057	122.1906229	40.3599668
3850	(2006 BE55)	55200	1.19627894	0.424609895	2.4237551	125.8549159	125.7441164	295.9569777
3851	(2006 BF55)	55200	1.69919979	0.393380899	3.3612109	172.1220801	306.6880134	283.8971761
3852	(2006 BG55)	55200	1.47042916	0.598354353	12.4471748	167.5612019	140.9891133	305.5658971
3853	(2006 BJ55)	55200	1.02851143	0.128538703	5.9192642	288.6632042	307.5070994	189.0284638
3854	(2006 BL55)	53763	1.45196752	0.307750289	3.8581543	25.0509376	130.8084683	347.5857278
3855	(2006 BM55)	53765	2.56738662	0.741608809	1.970971	258.0023878	313.7973906	348.267862
3856	(2006 BN55)	55200	1.87102898	0.554273763	18.6781683	291.4756267	125.4980935	212.8626724
3857	(2006 BO55)	55200	1.50149092	0.251961747	24.459163	253.7801421	288.5499934	359.8289022
3858	(2006 BF56)	55200	2.3549627	0.793274906	0.9631531	103.0889861	124.6200524	19.6422076
3859	(2006 BR98)	55200	1.19721998	0.162191751	10.0179882	7.3228107	129.8671946	354.3527754
3860	(2006 BF99)	53764	1.26455536	0.377955064	41.9463487	85.5163421	307.171834	51.4178434
3861	(2006 BG99)	53765	1.41257676	0.286459464	4.6806478	330.0393023	131.454847	16.7068629
3862	(2006 BH99)	55200	1.65089856	0.601337687	4.029952	84.0072919	130.9377893	283.7304953
3863	(2006 BX139)	55200	1.95915371	0.37795834	5.6661223	34.0543843	112.2759789	155.7430129
3864	(2006 BP147)	53766	1.28721774	0.240530102	5.5962168	123.0346801	110.8120927	36.2792527
3865	(2006 BQ147)	55200	0.81991479	0.422228354	24.3825953	153.1914687	146.8281532	256.2827407
3866	(2006 BX147)	53763	1.23632472	0.786940575	6.0609169	198.6966174	160.8772451	32.9447615
3867	(2006 BZ147)	55200	1.02351569	0.098667631	1.4089959	94.7137021	139.8417202	191.8137697
3868	(2006 BA148)	55200	1.6305845	0.614213437	15.7848264	25.9496344	327.6923986	53.4094948
3869	(2006 CD)	53768	1.86521689	0.431761196	9.0008883	297.9339456	105.3449066	29.269587
3870	(2006 CE)	55200	1.77891651	0.360761756	44.3169849	231.3436488	331.9566921	194.2699707
3871	(2006 CF)	55200	2.29087002	0.682272208	4.6655259	267.535876	112.9207693	81.4583667
3872	(2006 CG)	55200	1.82913944	0.336087054	4.347294	118.9522791	234.1136991	319.3676815
3873	(2006 CI)	55200	0.67636439	0.754992852	10.2603956	29.5340522	303.3425286	183.509606
3874	(2006 CK)	55200	1.08278143	0.214239302	5.1729689	264.5807211	310.9715805	112.4314072
3875	(2006 CL)	55200	1.66275259	0.412371882	8.1450337	151.7271688	312.9808282	309.5486013
3876	(2006 CS)	55200	2.9182168	0.697277783	52.2692183	346.2824257	172.4146493	268.0816806
3877	(2006 CT)	55200	1.09750255	0.230912436	2.7354456	82.6249122	285.6943528	258.2377976
3878	(2006 CU)	55200	1.50909864	0.453319378	3.7927885	252.9688256	148.9242353	79.6733142
3879	(2006 CV)	55200	1.14551995	0.381485279	20.2013331	284.5831981	330.466117	349.9211431
3880	(2006 CW)	55200	2.22771393	0.492035274	6.5429661	41.3176325	144.8785923	48.358332
3881	(2006 CX)	55200	1.7137956	0.296391275	28.9678952	160.890553	354.8489863	259.4475111
3882	(2006 CL9)	55200	1.34627705	0.236779502	2.9353417	9.9157268	139.3301047	172.4710052
3883	(2006 CT9)	55200	1.19456733	0.675729562	34.8103579	148.9493152	134.5785849	279.9163339
3884	(2006 CV9)	55200	2.72894197	0.527838343	19.5683276	33.0166857	116.5742236	312.2741125
3885	(2006 CW9)	55200	1.30364692	0.269603354	20.8644316	318.467925	135.339061	250.4537704
3886	(2006 CF10)	53773	1.52284555	0.370365207	18.9637343	311.7146875	135.837157	22.8371333
3887	(2006 CL10)	55200	1.70626408	0.445980837	7.6684933	89.900408	101.6071563	253.0335377
3888	(2006 CM10)	55200	2.13069269	0.700391724	18.2934659	92.1230394	143.2693542	71.8839387
3889	(2006 CN10)	55200	2.80080581	0.607544691	1.2369525	312.2502949	229.4842577	291.5800667
3890	(2006 CT10)	55200	2.89241488	0.662684862	12.9090057	30.3300341	111.3156166	284.8856516
3891	(2006 CU10)	53783	1.47530211	0.447478085	49.2321987	130.6351564	146.3345504	278.965598
3892	(2006 CX10)	55200	2.55504776	0.517417262	27.3285387	188.9612983	32.410359	327.176754
3893	(2006 CY10)	55200	1.96034071	0.48491604	6.7797873	167.3097742	32.5851103	133.8159083

#	Object	Epoch	a	e	i	w	Node	M
3894	(2006 DL)	53790	2.48133429	0.742808728	4.8469419	93.3550039	324.6058025	14.330071
3895	(2006 DM)	55200	1.35529151	0.212030069	7.0744725	177.7052275	333.9946133	162.6379449
3896	(2006 DN)	55200	1.38021082	0.275778218	0.2661798	101.4143617	96.357843	113.0679268
3897	(2006 DU)	55200	1.98343945	0.491912491	4.1339798	21.7032264	151.7531284	132.7432619
3898	(2006 DV)	55200	1.95290618	0.614186847	54.7325295	94.0393999	164.3283244	124.1113107
3899	(2006 DX)	53789	1.14081351	0.165201838	6.1735442	83.3156072	331.4044389	79.8931247
3900	(2006 DY)	55200	2.32058314	0.571466188	21.9941147	257.8619861	162.4463114	69.3203493
3901	(2006 DZ)	55200	2.3017443	0.440761288	23.9274284	151.4519125	343.1118437	45.8758699
3902	(2006 DA1)	53788	1.570365	0.483948458	26.6555166	248.5103695	333.9383056	335.1590051
3903	(2006 DB1)	55200	2.61716924	0.54218967	9.9407819	150.9202537	344.9487075	333.3670187
3904	(2006 DD1)	55200	2.30106082	0.66228333	8.4209628	63.0906389	154.1107524	27.1481863
3905	(2006 DP11)	55200	1.85959218	0.698021434	8.5470663	30.9927493	21.515967	213.9807257
3906	(2006 DP14)	55200	1.36527905	0.776198241	11.8314266	59.0434759	317.4055115	181.3898273
3907	(2006 DQ14)	55200	1.0278192	0.052950469	6.2968649	292.5155998	155.3424095	315.6160395
3908	(2006 DR14)	55200	2.48834097	0.652446897	5.825812	135.9569845	334.0262389	359.9260784
3909	(2006 DS14)	55200	0.86367039	0.336759413	26.5327245	187.4854539	162.2932383	90.6869793
3910	(2006 DT14)	55200	1.91086734	0.566630761	8.6548704	178.2032605	78.2900389	137.5423867
3911	(2006 DD42)	55200	1.98732113	0.438588513	4.7506361	170.9558717	335.8283469	140.4400992
3912	(2006 DO62)	53790	1.87801549	0.500248357	1.4284495	215.5503041	334.9040556	349.354211
3913	(2006 DP62)	53793	1.52044063	0.673562864	5.4528834	97.6605621	299.8973361	41.2259904
3914	(2006 DQ62)	55200	2.11372137	0.698593062	5.8852279	6.5667969	218.2388474	77.2142264
3915	(2006 DR62)	53792	1.96948262	0.447180805	6.0781326	345.5829428	154.6519265	5.477338
3916	(2006 DS62)	53792	2.26872808	0.570682708	1.8895813	38.1214884	153.5094379	351.9822864
3917	(2006 DU62)	55200	1.64012323	0.738142707	16.4766588	71.5100238	322.4305518	347.7233622
3918	(2006 DW62)	55200	3.24111595	0.642352606	19.5976341	182.3873619	345.4467161	236.2203028
3919	(2006 DM63)	53794	0.69549487	0.497629147	1.7812336	17.4291348	336.4322354	140.2426672
3920	(2006 DO63)	53795	1.45637262	0.406119048	6.2365783	66.3112759	161.2782958	330.889048
3921	(2006 DT63)	55200	2.38475812	0.471897446	4.7151146	188.9621375	335.8878002	16.2379888
3922	(2006 DU63)	53796	2.81265709	0.727457301	14.5588579	68.2347448	153.8274918	351.6004248
3923	(2006 EA)	55200	3.16297501	0.632218448	24.3467672	150.0693535	1.3225338	244.9381425
3924	(2006 EB)	53798	1.76756793	0.717904189	0.683245	119.7164155	286.3148745	24.4051406
3925	(2006 EC)	55200	1.13769255	0.217615742	7.5807033	245.4988397	347.608277	10.8985102
3926	(2006 EE)	53801	1.71162802	0.388466051	8.8150045	199.7826579	353.5888097	349.4724613
3927	(2006 EH)	55200	2.67936053	0.615255342	24.5299313	281.1631446	169.3485509	334.9216498
3928	(2006 EW)	55200	1.65196662	0.401859136	6.7460152	327.9005608	158.8881868	304.3571208
3929	(2006 EX)	53799	1.10729325	0.054226238	21.4921947	40.0129971	159.9358698	324.960012
3930	(2006 EY)	53804	1.42713115	0.275874594	3.9268817	218.2325418	350.0804517	337.9938728
3931	(2006 EB1)	55200	2.13432782	0.519027899	9.2713779	5.0219144	160.7373861	83.0579312
3932	(2006 EC1)	55200	2.38904517	0.755223442	11.1665626	15.462595	47.1194892	38.3757055
3933	(2006 EE1)	55200	1.20296503	0.276378678	36.4034023	278.0212246	154.2660454	18.4955522
3934	(2006 EF1)	53801	1.26276281	0.342264587	13.604425	296.4527865	328.2630895	298.906891
3935	(2006 EH1)	53800	2.03321389	0.569619129	5.4987686	49.9221679	164.1635577	347.8028283
3936	(2006 EW52)	55200	1.24561404	0.095556462	8.887232	304.8564357	343.6002547	156.4729923
3937	(2006 EJ53)	53805	2.17971917	0.430243846	23.8295356	212.2678138	346.1047387	349.1580915
3938	(2006 EK53)	53808	1.02510332	0.517049986	2.221398	41.1740421	5.2161477	67.9974415
3939	(2006 EF71)	55200	2.44763527	0.537985287	14.6494401	194.9338411	58.5051287	335.1884582
3940	(2006 FE)	55200	1.37389973	0.528899312	13.7846554	249.5905057	186.9111561	168.1920225
3941	(2006 FH)	55200	2.09755245	0.503474488	3.4726565	32.1039413	180.7613274	79.5076123
3942	(2006 FJ)	55200	1.17938164	0.287497707	27.7164251	229.1364393	187.6979367	90.7960024
3943	(2006 FK)	55200	0.92246183	0.343345083	14.6155789	3.1554437	15.2134591	251.2657353
3944	(2006 FU)	53819	1.52066361	0.412724381	13.9630301	233.1766182	5.4291105	337.2002867
3945	(2006 FV)	55200	1.36931107	0.231688702	9.5083607	308.5028822	181.0964863	164.2022982
3946	(2006 FW)	53819	1.38000716	0.374208576	13.8036872	266.5931441	177.8994541	51.3756045
3947	(2006 FX)	55200	1.4952134	0.438554706	24.6280933	299.4304106	181.2486165	51.6829859
3948	(2006 FJ9)	55200	1.74885702	0.345209672	4.1226447	101.4342021	166.5391587	178.9786645
3949	(2006 FK9)	55200	1.61244135	0.332424705	28.2000196	317.0956527	177.7414635	332.5904066
3950	(2006 FL10)	55200	1.54467965	0.304529065	18.7873571	88.6090557	11.0369812	45.634406
3951	(2006 FV33)	55200	2.21698354	0.518841871	18.9874349	272.4686593	197.0713692	84.0926011
3952	(2006 FW33)	53821	1.0302366	0.803277055	8.3380759	349.3454959	13.4975574	183.7475318
3953	(2006 FC35)	55200	1.72119201	0.374603287	21.1090607	121.7645262	17.8139911	261.0868995
3954	(2006 FV35)	55200	1.00105597	0.377549502	7.1018683	170.8722336	179.5708668	131.0382975
3955	(2006 FY35)	55200	1.8126146	0.359623613	21.253769	207.2184868	26.4531859	174.215256
3956	(2006 FG36)	55200	2.26854391	0.540425043	10.1582661	154.2231357	3.3859066	41.5109762
3957	(2006 FH36)	55200	0.95489049	0.198461923	1.5869252	154.7104629	280.7709427	104.6660671
3958	(2006 FD51)	55200	2.16591219	0.505843857	15.1803579	209.7422634	51.8931916	40.4725588

#	Object	Epoch	a	e	i	w	Node	M
3959	(2006 GA)	55200	2.45658406	0.616727102	18.0225957	304.8850635	188.2779607	2.5397461
3960	(2006 GB)	55200	0.95898215	0.179377693	10.0620045	242.8408401	183.8466775	100.5998973
3961	(2006 GC)	53833	2.18974128	0.577306532	5.6410183	62.179596	187.06008	347.5889503
3962	(2006 GU)	55200	2.70341434	0.580824347	17.5637441	145.8033039	149.4539242	263.5408014
3963	(2006 GZ)	55200	1.52749256	0.379879919	12.4840669	292.3758278	25.6799035	271.4992784
3964	(2006 GB1)	55200	1.13399887	0.288766291	0.8332719	220.8324475	76.2811411	329.0202018
3965	(2006 GC1)	55200	1.70495327	0.816277242	5.9827502	232.5868232	196.403441	276.132955
3966	(2006 GQ2)	55200	1.29053835	0.465675918	25.8422759	64.4725435	13.9650385	253.8426188
3967	(2006 GU2)	55200	1.08028455	0.256285822	3.3804335	266.2167603	197.1673139	184.7348512
3968	(2006 GV2)	55200	1.99082996	0.833054269	17.4333882	192.0687216	147.3410778	90.8961945
3969	(2006 GW2)	55200	1.44838332	0.190963205	9.4178246	114.8112975	136.0570544	19.7389087
3970	(2006 GX2)	55200	1.75762183	0.545301999	8.2279476	339.8369406	143.6849243	240.7099201
3971	(2006 GY2)	55200	1.85775524	0.495038536	30.5780931	216.6354101	54.3825051	145.8049561
3972	(2006 GT3)	55200	1.72122432	0.360710745	8.6703359	223.5971474	11.0626821	216.5598719
3973	(2006 HB)	55200	2.28738912	0.472241424	3.7712281	130.8755088	167.9407399	344.3947212
3974	(2006 HC)	55200	1.11056825	0.073946127	7.8415527	192.5491348	31.713978	48.2892191
3975	(2006 HC2)	55200	1.70982655	0.486902499	3.7482853	66.5055819	198.3285705	215.8047925
3976	(2006 HD2)	55200	2.02836632	0.60351607	4.0191018	95.6674613	30.4328928	127.4368993
3977	(2006 HE2)	55200	1.0650122	0.156705009	1.1799192	90.2197635	200.4500446	71.9637363
3978	(2006 HV5)	53846	0.84194719	0.315586619	31.8069667	317.6803548	35.9928276	246.8042415
3979	(2006 HW5)	53849	2.39307538	0.569474623	6.0297766	176.4687346	26.783373	1.8302008
3980	(2006 HX5)	55200	1.64284795	0.250453221	21.2373999	49.4923336	38.0802653	11.8990002
3981	(2006 HY5)	55200	1.74828199	0.337341117	36.0593492	276.3144992	38.6085499	159.0943183
3982	(2006 HZ5)	55200	1.20207685	0.206238344	4.2785793	307.3835029	202.895619	334.7675762
3983	(2006 HA6)	53848	3.25295436	0.633935847	22.7068199	157.1215237	17.0165548	7.5256948
3984	(2006 HF6)	55200	1.40603144	0.549874879	6.5844366	86.4093221	29.524079	113.6007682
3985	(2006 HJ18)	55200	1.08418026	0.317436185	10.2506011	28.8611741	75.2460212	172.4341147
3986	(2006 HR29)	55200	0.98514703	0.263275146	9.5449672	212.5273026	232.7496494	15.7296244
3987	(2006 HQ30)	55200	2.61383336	0.598331311	11.9271914	179.6005735	85.7223855	302.8418663
3988	(2006 HS30)	53850	2.37508083	0.575175861	2.3236323	20.3920471	208.4936098	356.8371317
3989	(2006 HT30)	55200	2.56855388	0.616488962	1.6409946	224.1251428	73.6313145	298.1417434
3990	(2006 HU30)	55200	1.4548285	0.420011487	24.0044098	274.2183396	44.7230724	334.1715257
3991	(2006 HV30)	53851	1.59242561	0.371375428	34.8735211	61.2469247	206.1153045	336.3927918
3992	(2006 HX30)	55200	1.48064521	0.309832199	1.0012672	38.0127747	180.3982605	16.6588034
3993	(2006 HU50)	55200	1.28759042	0.246854785	5.9059839	214.2894846	46.9539521	161.88621
3994	(2006 HV50)	55200	0.8487845	0.260683231	16.4174262	22.629995	34.7812332	43.6475283
3995	(2006 HW50)	55200	1.23538041	0.19089774	5.5424291	323.2885774	216.1987548	271.9395405
3996	(2006 HY50)	55200	2.58361203	0.62875075	25.700296	77.8210527	44.583267	338.4035298
3997	(2006 HY51)	55200	2.60414924	0.969216317	30.6107095	340.5290218	42.3979524	299.61214
3998	(2006 HZ51)	55200	1.89771737	0.449527945	12.4112603	193.2153957	84.3495808	111.050772
3999	(2006 HH56)	55200	1.3640176	0.32437978	23.8373561	238.4445884	40.6083049	80.9707965
4000	(2006 HV57)	55200	2.74305845	0.575057618	5.9974023	17.3450363	265.0001381	272.3394642
4001	(2006 HW57)	55200	2.14431978	0.520571961	7.1526793	33.5733173	251.2233003	39.7326964
4002	(2006 HX57)	55200	1.80684871	0.494288151	0.1970381	160.6675299	110.6195505	168.8409444
4003	(2006 HY57)	55200	2.66965461	0.569640369	26.3852558	11.2844491	221.0508073	302.2708484
4004	(2006 JE)	53857	1.77921562	0.75237413	14.9804584	286.0097883	43.4364435	340.3651825
4005	(2006 JF)	55200	1.08463816	0.658038377	42.6016425	211.0311519	216.2859719	177.8322021
4006	(2006 JO)	55200	2.37640193	0.668648006	8.2089448	248.2273902	41.2092826	348.6595892
4007	(2006 JP)	53861	1.6974119	0.317630087	18.7623654	7.4775589	221.2673387	359.0053103
4008	(2006 JT)	53863	2.40047272	0.486198362	36.4750696	161.978898	21.0536842	6.6404246
4009	(2006 JU)	55200	2.15785524	0.468584522	5.3554392	89.3291461	214.0128587	24.38715
4010	(2006 JX)	55200	1.70894998	0.272596985	23.882367	315.3204279	233.3797628	250.4978004
4011	(2006 JM6)	53862	2.03554288	0.489853586	9.2117287	187.6111327	42.640123	357.9518229
4012	(2006 JN6)	55200	1.70471832	0.32169917	17.1721303	22.4510758	238.905949	214.152221
4013	(2006 JX25)	55200	2.15122821	0.432542248	3.0779375	262.2579968	44.3067741	19.648289
4014	(2006 JY25)	55200	1.12591603	0.479178486	6.8700783	321.5739475	64.0950254	268.3424334
4015	(2006 JZ25)	55200	2.40686937	0.54846877	10.3157613	305.8748749	337.983846	340.7322905
4016	(2006 JV26)	55200	2.01547346	0.796582202	3.6349643	114.8696614	223.0132283	84.5498318
4017	(2006 JY26)	55200	1.00552946	0.082810358	1.4398018	271.4171559	43.7145108	137.6206837
4018	(2006 JT41)	55200	1.75165207	0.403282252	1.7924747	80.6328742	117.5398358	220.2610309
4019	(2006 JU41)	55200	2.12338872	0.429507448	7.6113146	235.9644359	52.1687931	35.3603716
4020	(2006 JE42)	55200	2.64006181	0.591117637	5.3731584	263.2208061	350.3331591	302.7956231
4021	(2006 JF42)	55200	0.6719945	0.581535024	5.9704415	17.6952351	41.0082309	2.2089229
4022	(2006 KA)	55200	1.63341299	0.561434946	31.0180221	244.6301647	236.0825742	305.1479884
4023	(2006 KC)	55200	1.22095681	0.473591073	14.470296	254.4251285	237.0864093	299.7007324

#	Object	Epoch	a	e	i	w	Node	M
4024	(2006 KE)	55200	2.18711603	0.493940972	19.4815573	69.9938235	232.8332156	18.544792
4025	(2006 KB1)	55200	2.45861889	0.685048095	0.3719581	10.3145576	161.1351501	350.1913713
4026	(2006 KD1)	55200	2.48245678	0.784564781	30.7056531	338.2159221	168.979582	347.0879212
4027	(2006 KP1)	55200	2.14843478	0.50214198	6.7831126	76.9832912	219.5815736	30.1404585
4028	(2006 QK1)	55200	1.24431329	0.175333537	9.6032849	18.2070014	88.7174952	334.0307255
4029	(2006 KR1)	55200	1.16265708	0.404048704	19.5846952	176.2904158	236.8671342	156.0334923
4030	(2006 KS1)	55200	1.46887304	0.314261845	3.6481355	322.4224298	237.5704219	33.6429567
4031	(2006 KK21)	53882	2.73666795	0.871607153	11.9490364	276.2637209	198.8665213	13.0530156
4032	(2006 KL21)	55200	1.20015397	0.127975649	9.3559111	213.9125884	117.3048219	188.9748022
4033	(2006 KP21)	53879	2.04917289	0.516030945	5.0161117	299.7537183	237.1344855	18.4110936
4034	(2006 QK21)	55200	2.30577948	0.464034219	6.2919878	164.04861	179.5939183	319.0943032
4035	(2006 KZ37)	55200	1.28471261	0.208698669	21.3702583	243.1655189	95.721218	96.8018159
4036	(2006 KS38)	55200	1.43148537	0.456273707	28.7165658	101.1110533	63.4740616	71.7110427
4037	(2006 KT38)	53880	2.65845309	0.549621306	23.9085436	89.4969163	227.8916507	332.499957
4038	(2006 KZ39)	53881	0.60936464	0.541241863	9.9258758	354.2901286	41.5130086	192.3770602
4039	(2006 KA40)	55200	2.35070289	0.485564835	4.9761238	85.9665923	232.6788162	325.625683
4040	(2006 KC40)	55200	1.6681376	0.529307732	8.8145164	260.2583253	78.0653955	209.0816335
4041	(2006 KD40)	55200	2.01739766	0.511685848	21.1166189	217.8152316	86.7929563	76.1968314
4042	(2006 KY67)	55200	2.07378658	0.535307424	3.0278153	173.9374111	117.2135955	61.7406766
4043	(2006 KV86)	55200	1.54305327	0.374180674	37.0686469	153.764179	220.0922567	194.3838506
4044	(2006 KY86)	55200	2.29323109	0.649999229	7.3606799	320.5453635	223.2169666	27.4844279
4045	(2006 KZ86)	55200	2.19140415	0.862057968	14.2691337	0.0434303	103.6193506	70.0097203
4046	(2006 KF89)	55200	1.87018892	0.309063483	38.1762565	72.5834196	246.314932	108.144381
4047	(2006 KJ89)	55200	2.38708483	0.542635761	2.9901782	95.710291	163.45839	348.8548475
4048	(2006 KK89)	53885	1.02882251	0.176869249	16.6729824	318.8252886	62.2676229	234.5509436
4049	(2006 KL89)	55200	2.74112558	0.547331887	13.7233804	155.1013639	84.3250716	290.6104513
4050	(2006 KM89)	53889	1.59871119	0.275442671	3.0505152	143.5038203	118.427301	354.5347893
4051	(2006 KN89)	53888	1.79421173	0.53203537	5.825171	108.300893	217.6586233	337.9402289
4052	(2006 KV89)	55200	1.15026332	0.272919322	3.5547503	87.733779	71.7834981	23.9462357
4053	(2006 KF100)	53886	2.06990303	0.429580882	23.3146003	240.0618373	51.0322739	333.4551127
4054	(2006 KK103)	55200	2.12810955	0.463891937	8.1468564	210.3237814	70.3291437	46.547871
4055	(2006 KL103)	53887	1.4492973	0.285022466	0.3465861	182.8762843	50.6898293	8.26763
4056	(2006 KM103)	55200	1.57420569	0.376949176	11.6792692	196.7932604	169.6137059	220.8351174
4057	(2006 KY112)	53892	1.43738158	0.250515678	20.1735459	170.3484157	75.5613882	2.3026234
4058	(2006 KZ112)	55200	2.52377003	0.887189119	37.8017991	358.155443	166.2824809	337.6840615
4059	(2006 LA)	53888	1.55323142	0.837919859	11.0375031	67.6194731	27.2626443	26.247114
4060	(2006 LB)	53888	1.67626578	0.322763431	6.9530239	354.6442488	248.4997353	1.9917397
4061	(2006 LC)	55200	1.48135375	0.357383435	11.7344133	52.2880239	249.6893634	332.006621
4062	(2006 LD)	53888	1.23122793	0.100866998	24.5609368	187.600438	67.7745105	355.1672762
4063	(2006 LF)	55200	2.14223225	0.654465073	7.8755479	349.1867925	199.5631779	69.3107369
4064	(2006 LH)	53890	1.08479025	0.316044495	7.819512	264.6285737	95.3356116	290.2705427
4065	(2006 LK)	55200	2.85842253	0.638743878	10.1781142	194.3142788	157.7886283	238.9767142
4066	(2006 LM)	55200	1.71266892	0.432556367	6.6705145	215.6601167	74.3285753	202.2249234
4067	(2006 LD1)	53896	2.33156067	0.698481971	5.9614049	274.5452194	66.899921	345.7866829
4068	(2006 MA)	55200	2.64728856	0.530614025	24.7425307	81.9036563	241.055555	276.9660633
4069	(2006 MB)	55200	1.11364237	0.082973292	14.428117	287.0066252	257.6720321	76.7529763
4070	(2006 MV1)	55200	1.31441905	0.240531104	4.2956823	31.2387477	265.0024843	111.6255966
4071	(2006 MW1)	55200	2.41938934	0.517465486	19.5121373	173.3529359	96.6774494	340.6526915
4072	(2006 MY1)	55200	2.05053061	0.435258486	3.093283	37.0986311	202.7793603	81.8980612
4073	(2006 MS6)	55200	2.63751848	0.569795854	21.3812504	187.4595011	108.5003914	295.1869122
4074	(2006 MT6)	55200	2.8136284	0.54720086	6.0878786	195.2295237	112.1785325	263.2923078
4075	(2006 MF10)	55200	2.22130434	0.42332265	3.0437434	64.4577172	196.789445	32.2307348
4076	(2006 MH10)	55200	1.24603719	0.155777308	13.3450771	253.6399435	87.9503907	137.5371413
4077	(2006 MJ10)	55200	1.87610065	0.585897398	39.2828391	272.4956945	106.2041902	106.8292432
4078	(2006 MD12)	55200	0.83859896	0.605172468	27.269365	174.5231017	291.8512294	58.4434258
4079	(2006 MX13)	55200	2.17400803	0.466096552	5.7363099	318.6398238	8.3823549	18.1871469
4080	(2006 MY13)	53920	1.26253948	0.60885814	45.0613418	228.6631634	288.4482081	53.0242783
4081	(2006 MA14)	55200	2.11945564	0.492302941	7.4241296	330.5854109	311.6885218	49.5207526
4082	(2006 MB14)	55200	1.03369822	0.114287849	19.5217706	269.3788196	276.5940591	203.1144989
4083	(2006 NL)	55200	0.84774526	0.575931275	20.0800637	29.3454226	115.2616823	274.9431423
4084	(2006 NM)	55200	2.78408715	0.615438974	14.1956966	30.0358397	292.6471338	260.1084155
4085	(2006 OZ)	55200	2.20207923	0.466416422	5.0108004	318.674138	40.5287545	0.6800076
4086	(2006 OA1)	53936	1.38006328	0.264480127	35.6874599	236.9515958	115.2121877	328.9175357
4087	(2006 OM1)	55200	1.73965131	0.387364604	33.2831459	323.9299935	303.4798355	195.8164358
4088	(2006 ON1)	55200	2.54773274	0.613216836	3.5302287	50.8407373	288.464961	296.0135855

#	Object	Epoch	a	e	i	w	Node	M
4089	(2006 OK3)	55200	1.67782472	0.518882656	12.1884565	66.7641383	300.2457688	190.5149701
4090	(2006 OX4)	55200	1.60481862	0.263909404	18.5271473	342.2551814	300.4327183	262.7576108
4091	(2006 OY4)	55200	2.36303726	0.539195428	2.9468306	231.5930156	84.4609048	337.8693153
4092	(2006 OZ4)	53938	1.02202358	0.432653624	17.4816693	141.5258607	278.5921347	283.1857514
4093	(2006 OA5)	55200	1.52342614	0.378398124	10.8330138	87.2854176	308.5512649	252.3347899
4094	(2006 OB5)	55200	1.53300952	0.218733806	0.7122489	357.2641446	356.2250684	265.8000326
4095	(2006 OC5)	55200	2.40026539	0.651940239	4.747125	245.6605028	149.2613738	314.62872
4096	(2006 OD5)	55200	2.66724118	0.546309728	10.3809839	223.6713302	143.8715457	269.8039595
4097	(2006 OF5)	55200	2.7521771	0.537455983	10.1626115	194.9603798	137.4273778	268.5098574
4098	(2006 OS5)	55200	2.86344013	0.591472257	26.4553715	58.3448321	293.1975579	244.8920856
4099	(2006 OV5)	55200	2.70123117	0.573845543	15.2477641	154.063069	156.5528079	286.1727729
4100	(2006 OB7)	55200	2.10592334	0.510664638	6.5844198	22.6998191	289.8866255	42.8144922
4101	(2006 OC7)	55200	2.19695858	0.526579156	11.0217863	339.4706509	298.7671354	27.1371444
4102	(2006 OD7)	55200	1.33481896	0.166334273	30.3328926	197.2448124	127.7090918	66.7069681
4103	(2006 OE7)	53943	1.5480655	0.780193576	10.3920851	150.430963	291.8205538	333.0291955
4104	(2006 OS9)	55200	2.74610161	0.903005361	21.1237082	36.0046972	127.4286441	282.2080178
4105	(2006 OT9)	55200	1.12370547	0.181898719	14.5663621	193.9656192	310.287928	115.6488494
4106	(2006 OE10)	55200	1.65216725	0.358333702	2.4654019	332.7933101	323.8725941	226.6864109
4107	(2006 OU10)	55200	1.75425283	0.350013549	33.7151339	173.3820248	335.277046	8.0769662
4108	(2006 OY10)	55200	1.80661096	0.574492895	35.6284519	92.3528917	234.1583403	123.86892
4109	(2006 OF15)	55200	2.00835201	0.354213494	23.1996026	246.017061	122.6321717	55.2076964
4110	(2006 OG15)	55200	2.54467569	0.627061331	17.1582465	264.0808813	119.1717959	287.5248003
4111	(2006 OH15)	53949	1.51151774	0.294554006	37.0023231	76.86139	122.9725643	74.7593355
4112	(2006 PW)	55200	1.38135346	0.651615243	35.8771879	325.0792149	132.9961445	322.6384911
4113	(2006 PA1)	55200	2.03417807	0.549978322	2.4332404	85.4966368	322.5515335	29.4087717
4114	(2006 PB1)	55200	3.01285643	0.593172863	15.333337	276.9553839	94.5123805	222.7687673
4115	(2006 PF1)	53966	2.19295769	0.878358226	14.0448946	333.8943118	126.5166692	344.1208812
4116	(2006 PY17)	55200	1.8983867	0.639801392	2.8480414	132.867058	310.3218925	65.7583968
4117	(2006 QA)	55200	2.76305331	0.623454529	5.3155618	216.4247855	133.83384	260.0778953
4118	(2006 QE)	55200	1.13885424	0.503469111	27.2331131	129.381433	331.2793155	210.2487344
4119	(2006 QS)	55200	2.54743153	0.511795982	4.5902555	143.1069683	164.419835	304.3473429
4120	(2006 QX5)	55200	2.12251528	0.454071205	5.9882359	6.388157	326.2310945	31.5329101
4121	(2006 QY5)	55200	1.89848414	0.342322403	1.7251804	227.4318138	145.9547894	83.8457886
4122	(2006 QQ23)	55200	0.80376514	0.284576379	3.4392113	124.7580948	4.9415111	76.2994401
4123	(2006 QS23)	55200	1.19255996	0.502417083	19.9711522	303.6707753	154.8808084	149.0720626
4124	(2006 QA31)	55200	1.19780445	0.457637542	11.8490997	358.5343883	95.8971163	317.6973685
4125	(2006 QB31)	55200	1.17691112	0.611562779	24.7210631	228.4156607	341.0747644	276.6889431
4126	(2006 QK33)	53972	2.55051106	0.58736057	14.6628123	192.8895393	150.6800149	357.8240768
4127	(2006 QM33)	53975	1.80037688	0.309758094	40.2733314	174.0554384	154.9149032	3.4324372
4128	(2006 QK40)	55200	2.12034734	0.572130014	2.6209879	143.3998962	133.7172574	45.1804039
4129	(2006 QQ56)	55200	0.98510577	0.045614947	2.7970159	331.4738853	161.2157032	355.7284692
4130	(2006 QZ57)	53977	2.56324171	0.771118638	2.4245275	324.6528007	270.7123812	14.5608999
4131	(2006 QA58)	55200	1.2496153	0.17280915	26.6063178	283.6568079	152.5081975	61.8150485
4132	(2006 QB58)	55200	2.11370956	0.48010763	5.8956011	325.2275251	337.42873	43.2622833
4133	(2006 QJ65)	53993	2.64641069	0.6847176	5.1000481	266.47835	153.1349353	348.1906083
4134	(2006 QE89)	53978	1.95425006	0.565436179	20.9763841	75.7945704	319.8003827	344.6786269
4135	(2006 QR89)	55200	1.88934234	0.36664148	9.2397407	263.5521779	166.5005887	50.7080662
4136	(2006 QS89)	55200	1.77840655	0.365713566	16.6016408	229.9730529	159.2676726	124.5929542
4137	(2006 QT89)	53981	1.48404179	0.473502028	24.5549223	56.1508422	162.5202618	65.8991098
4138	(2006 QU89)	55200	1.53045031	0.274227443	14.7861962	79.2364768	162.2710092	341.7591688
4139	(2006 QV89)	55200	1.19177097	0.224263935	1.0700786	236.6832192	166.0751801	162.7653231
4140	(2006 QW89)	55200	2.61840488	0.566116188	4.8732202	136.340581	125.5227772	311.4030701
4141	(2006 QY110)	55200	1.92469817	0.572937068	6.4076536	221.4785418	222.7295982	68.5221617
4142	(2006 QM111)	55200	2.59129622	0.729859186	1.4231665	256.5595017	155.8004156	278.3728991
4143	(2006 QN111)	53977	2.48692117	0.597951044	11.7456254	171.770925	143.8393304	4.5717263
4144	(2006 RZ)	55200	2.4630598	0.642586409	9.0253128	221.0184787	197.5175902	294.2869595
4145	(2006 RJ1)	55200	0.95065828	0.300693562	1.4146233	110.2672068	93.4972446	332.6985004
4146	(2006 RK1)	55200	1.95027855	0.51648697	9.5517693	131.5994521	153.9682513	96.2678507
4147	(2006 RG2)	55200	2.69499145	0.651033551	8.583719	75.19374	30.9990817	247.7247612
4148	(2006 RH2)	55200	1.08655929	0.08176896	11.7818728	222.7804583	172.2967252	293.4044758
4149	(2006 RG7)	55200	1.88515418	0.350153721	22.0244299	191.9549427	181.0480259	84.719349
4150	(2006 RH7)	55200	2.19810806	0.758314348	10.7386883	114.1187278	358.2368542	339.3084947
4151	(2006 RJ7)	53995	1.83353514	0.58213804	1.8745856	251.1302102	177.0063876	340.853526
4152	(2006 RO36)	55200	0.90603722	0.231138683	23.8567791	261.1274427	270.9959579	75.7908373
4153	(2006 RA55)	55200	2.43424395	0.499551292	1.808068	60.5649378	22.0992482	286.7137731

#	Object	Epoch	a	e	i	w	Node	M
4154	(2006 RH120)	55200	1.03324339	0.024451629	0.5955139	10.1087575	51.126528	2.9133632
4155	(2006 SB)	55200	1.15131575	0.198102144	16.1507226	243.3954803	175.1604653	195.8196807
4156	(2006 SC)	55200	1.11254899	0.349692072	10.426357	265.1192288	350.8895062	349.7896695
4157	(2006 SV5)	55200	1.44518676	0.293273922	4.8275704	208.1288484	182.2856073	302.7463137
4158	(2006 SW5)	55200	1.83302056	0.395343003	9.0127077	129.4361515	350.4408162	41.4065542
4159	(2006 SY5)	55200	1.04331952	0.152420302	7.5656476	175.5623722	335.9838876	245.3308915
4160	(2006 SA6)	55200	2.78784254	0.619965119	5.808764	64.8352824	227.6562603	272.1674619
4161	(2006 SC6)	55200	1.20280808	0.580808561	30.263669	355.4913079	153.0169752	75.709715
4162	(2006 SD6)	55200	1.5156149	0.301663923	35.7497238	264.8675126	169.9910298	222.6845738
4163	(2006 SE6)	55200	0.80511165	0.345607146	4.8176681	182.9037626	347.5309907	27.2670011
4164	(2006 SF6)	55200	0.94914026	0.280548959	5.8648487	305.572559	228.1466793	29.4709477
4165	(2006 SA7)	55200	1.98764181	0.361485364	35.6086126	265.1223884	0.676022	120.551653
4166	(2006 SF7)	55200	1.04627593	0.213096515	24.4934438	283.8214141	180.486462	307.0620721
4167	(2006 SG7)	55200	1.0427854	0.561163204	4.760312	133.3232131	2.2908951	317.3450195
4168	(2006 SH7)	55200	2.48156781	0.544422362	5.1009745	344.5110595	83.2379201	286.9034468
4169	(2006 SO19)	55200	1.24236668	0.272003323	14.2426704	169.6804934	98.3767963	191.8003233
4170	(2006 SP19)	55200	0.88115655	0.293175527	4.5917766	165.9916491	358.5499977	195.7675728
4171	(2006 SQ19)	55200	2.35512776	0.512057089	6.2422734	13.8664176	349.6506529	325.8922913
4172	(2006 SR19)	55200	2.80371064	0.557426362	2.9029751	33.5154324	351.2453334	247.299936
4173	(2006 SS19)	55200	2.80289378	0.574038025	11.6024487	142.2529954	154.4612887	272.0805113
4174	(2006 SD25)	55200	1.91603056	0.468824441	1.4535738	37.0853784	296.9255347	93.8982647
4175	(2006 SU49)	55200	1.41286405	0.312122427	2.5187569	198.907952	303.2150599	223.5867778
4176	(2006 SK61)	55200	1.38047397	0.264333957	0.3541971	62.4039641	304.7108758	4.6151152
4177	(2006 SF77)	55200	0.9219344	0.328987811	32.4898135	224.3747661	1.2763717	359.535038
4178	(2006 SG77)	55200	2.81351277	0.577734866	7.6097705	158.1632948	237.5152323	242.7760351
4179	(2006 SO77)	55200	1.81826278	0.462850442	2.146532	339.7332101	354.6304946	130.4651433
4180	(2006 SQ78)	55200	1.88004806	0.560256229	17.339744	352.4881759	4.5646707	106.3085858
4181	(2006 SQ78)	55200	1.17186816	0.338935751	36.0605664	32.9419552	208.1442422	316.5800171
4182	(2006 SR78)	55200	2.16094883	0.561575305	20.0570614	267.9169732	13.7010889	42.2977447
4183	(2006 SN131)	55200	2.11723449	0.519735273	6.0759948	1.4098317	2.8672288	22.1764703
4184	(2006 SP131)	54006	1.12210996	0.308825726	20.0659562	100.9214473	3.3132189	295.9591092
4185	(2006 SQ131)	55200	1.72172929	0.3052655	12.8395837	166.3655454	185.0061834	169.2990724
4186	(2006 SR131)	55200	1.35192125	0.336985022	0.6306671	120.9452655	184.9215307	58.6777958
4187	(2006 SS131)	55200	1.62290375	0.380965108	4.7251308	159.6466008	183.3196833	218.9064104
4188	(2006 ST131)	55200	1.46990383	0.316466662	32.8784552	265.738403	194.4906524	247.099897
4189	(2006 SU131)	55200	1.72775712	0.395501719	9.6561964	167.6228497	107.4667073	216.4733072
4190	(2006 SJ134)	55200	2.20439414	0.47643405	26.0745515	303.1427317	129.8578075	341.5003699
4191	(2006 SK134)	55200	1.87935123	0.536168112	34.6933421	74.3280714	185.3135575	130.0368839
4192	(2006 SP134)	55200	2.05143973	0.735659599	13.0460888	192.2448234	16.6842485	137.5002732
4193	(2006 SQ134)	54006	1.2432095	0.252791952	10.1725437	246.9376348	186.8454061	317.8438841
4194	(2006 SR134)	55200	1.88350779	0.462983357	1.5992423	262.444859	45.1701017	117.3251772
4195	(2006 SS134)	55200	1.17123323	0.441833285	19.5375253	256.0476672	9.1032435	258.1065494
4196	(2006 SV134)	55200	1.8672761	0.48029735	21.5459541	64.3034762	217.3022679	146.5138487
4197	(2006 SB142)	55200	2.2356117	0.432403701	7.6702231	18.0674837	9.6860254	343.9358999
4198	(2006 SV189)	55200	1.89300357	0.32113768	15.8637309	61.2496699	4.3183089	58.666856
4199	(2006 SJ198)	55200	2.08987435	0.455884357	2.4325032	212.2404759	266.9099243	303.1487965
4200	(2006 SL198)	55200	1.79982336	0.373738403	16.5558967	213.0369238	173.2990249	110.2343875
4201	(2006 SM198)	55200	2.36710907	0.53406696	11.0689029	345.1209674	359.3396027	326.692669
4202	(2006 SN198)	54008	1.25682911	0.511538047	1.6014117	71.0965143	195.9735235	40.8288774
4203	(2006 SO198)	54009	1.92318746	0.862797946	9.7565082	125.3660781	10.385957	344.1533128
4204	(2006 SP198)	55200	2.93259953	0.574224549	6.9297672	226.3780149	192.6947711	221.982669
4205	(2006 SU217)	55200	0.98566865	0.174745526	2.6411614	37.9840461	194.2462903	239.3644843
4206	(2006 SV217)	54012	1.32490086	0.355105019	0.8874673	97.2393367	179.6099672	53.4631852
4207	(2006 SX217)	55200	1.4109125	0.309806761	21.0494765	176.1802201	32.6753273	158.3540791
4208	(2006 SY217)	55200	1.92832729	0.439175439	6.6141161	49.9560075	23.7266892	56.574114
4209	(2006 SZ217)	55200	1.67290394	0.285506159	29.2165627	162.9469282	241.4158374	196.3251257
4210	(2006 SF281)	54009	1.33759674	0.263882705	3.025237	31.2022143	9.8494127	341.3074461
4211	(2006 TB)	55200	1.56199136	0.324647467	27.5674022	180.8757225	169.3596862	247.0768438
4212	(2006 TC)	55200	1.53844307	0.911562664	19.700478	60.6710802	152.6252631	278.0675241
4213	(2006 TD)	55200	1.59117366	0.393699013	8.1855081	159.3593968	166.5317175	241.9610382
4214	(2006 TF)	54010	2.33290678	0.561554485	3.494111	182.3853983	187.8670451	359.9418313
4215	(2006 TK)	55200	2.16235952	0.511441488	6.4362873	252.5543955	40.1323448	45.5908619
4216	(2006 TL)	55200	0.94051411	0.398101443	11.6307033	315.1971284	195.4262629	107.8602701
4217	(2006 TN)	55200	1.56152042	0.345247639	17.2692143	131.4975407	24.4120509	127.347194
4218	(2006 TO)	55200	2.4179702	0.515215531	4.7196569	202.6518085	204.9043589	303.3025973

#	Object	Epoch	a	e	i	w	Node	M
4219	(2006 TC1)	55200	1.71985467	0.375677994	4.4985405	160.7511732	326.1523917	89.8099436
4220	(2006 TD1)	55200	1.89350367	0.360569062	2.4202037	5.6608816	57.2205749	68.9603671
4221	(2006 TF1)	55200	2.56497667	0.605711281	5.1142894	297.3672809	44.7134391	290.7607474
4222	(2006 TB7)	54014	1.25141015	0.199260101	21.2603859	154.0109773	185.1813811	21.7510264
4223	(2006 TH7)	55200	2.53046867	0.83492622	17.5528768	336.536959	162.9502709	271.6461883
4224	(2006 TJ7)	55200	1.78253072	0.422098019	11.6919574	193.9186554	193.4592958	125.1317443
4225	(2006 TR7)	54023	1.32615886	0.376818226	2.8612699	120.150139	182.9200279	39.3743699
4226	(2006 TS7)	55200	0.94674282	0.579984274	5.4660905	299.7598314	225.4181258	93.9032549
4227	(2006 TT7)	55200	2.85716594	0.562868416	12.9290189	296.0970908	70.041752	246.1456347
4228	(2006 TU7)	55200	0.85082983	0.470227609	2.9121477	68.6279934	91.9036333	302.3563459
4229	(2006 TA8)	54024	3.00019034	0.695031511	21.7525541	217.9489992	208.040899	354.1961936
4230	(2006 TC8)	55200	2.1524162	0.761139684	31.5587597	67.3070248	204.4745377	28.1441933
4231	(2006 UA)	55200	1.52882551	0.486125872	14.3279272	270.6866439	23.2955678	286.8082499
4232	(2006 UE)	55200	2.80807237	0.574032681	5.0170736	12.3997674	21.98805	242.82592
4233	(2006 UF)	55200	2.45595846	0.529550045	6.9451828	203.5884954	207.6001195	294.2558859
4234	(2006 UJ)	54026	2.23367331	0.493827184	5.3581473	164.5824344	203.4404565	5.6077221
4235	(2006 UK)	55200	1.49182256	0.538598437	4.7229052	252.0510744	244.2334763	217.9592541
4236	(2006 UL)	55200	1.40367772	0.269930985	7.2407982	165.0814869	204.6725071	343.913679
4237	(2006 UM)	55200	2.23334488	0.539310814	15.9013537	55.2746835	57.065646	321.7633694
4238	(2006 UN)	55200	1.54898997	0.330825565	0.4946243	71.9444421	323.4656344	234.8318306
4239	(2006 UO)	55200	2.82578453	0.666013188	2.2946306	77.7709478	26.1008255	231.6700919
4240	(2006 UP)	55200	1.58728098	0.301982282	2.2832566	334.7329543	48.0455111	221.3453294
4241	(2006 UR)	55200	2.01934487	0.447583589	5.3243042	200.0513727	263.3557976	1.1086114
4242	(2006 UX1)	54028	1.71985719	0.3968848	20.4439255	96.2032824	21.1226812	315.133827
4243	(2006 UY16)	54029	2.1615081	0.525981242	3.2033368	337.8185213	21.2810995	6.8901837
4244	(2006 UA17)	54029	1.37189951	0.286587963	21.9034239	116.6719193	207.8169507	36.6959168
4245	(2006 UB17)	55200	1.14064807	0.103795617	1.9912043	135.165518	213.9777169	259.9098229
4246	(2006 UD17)	55200	3.21630921	0.653537356	16.8071394	148.9518135	233.0461167	203.9333595
4247	(2006 UE17)	55200	1.17598982	0.33255638	12.1321428	115.2584199	27.7741808	114.1200748
4248	(2006 UF17)	54035	2.48078907	0.809911277	3.7369039	235.4078393	47.9760936	15.5695552
4249	(2006 UQ17)	55200	1.62340064	0.381017094	1.7440459	10.2978129	82.121854	166.3530992
4250	(2006 UT17)	54037	2.34147785	0.541561922	2.0334054	49.5317728	15.5449568	352.9157988
4251	(2006 UU17)	55200	2.32926396	0.58410074	2.8877058	151.2147214	209.1492828	330.7062047
4252	(2006 UC63)	55200	1.4727336	0.281955947	16.6577269	327.944062	219.7047474	141.3475482
4253	(2006 UD63)	54030	2.2463359	0.441454613	7.2508342	136.895551	148.0123196	49.7205672
4254	(2006 UF63)	55200	2.28297903	0.484987169	23.8173082	295.7172755	46.5989567	350.2830713
4255	(2006 UB64)	54035	2.09945293	0.695960242	9.4724367	359.1766799	130.4204674	341.022155
4256	(2006 UC64)	54032	2.03314142	0.700229085	6.1035944	268.1760743	212.106155	342.3898334
4257	(2006 UD64)	55200	2.10721272	0.791160057	29.728477	303.8876867	205.9039343	347.6122014
4258	(2006 UE64)	54032	1.31977599	0.384130404	7.8564401	289.9627796	27.2325336	35.2057658
4259	(2006 UG64)	55200	1.89785207	0.369801942	20.98309	202.7583386	152.5108066	87.9035082
4260	(2006 UY64)	55200	0.93147153	0.157542854	26.2130225	210.8525819	30.8295994	332.3963892
4261	(2006 UC185)	55200	1.5260297	0.397459811	4.3051299	307.4390275	37.5223027	269.3763319
4262	(2006 UE185)	54038	2.29562455	0.490521898	1.0477006	183.7468777	210.6428878	0.6449376
4263	(2006 UF185)	54038	1.22790129	0.603706515	33.7667921	307.2214396	221.9460106	304.5141451
4264	(2006 UH185)	54037	1.74242654	0.394801905	11.4097004	196.8450278	213.9672097	353.4063228
4265	(2006 UJ185)	55200	1.69259222	0.579262376	0.8650223	78.7559805	35.0475096	138.4023856
4266	(2006 UL185)	55200	0.84407779	0.501502069	19.4110567	177.2635242	52.3447169	186.7352348
4267	(2006 UY215)	55200	1.38087379	0.459171482	9.350052	262.9515253	215.752127	312.3586746
4268	(2006 UZ215)	55200	0.89010584	0.20693378	14.272922	222.1398371	35.2260397	46.0854848
4269	(2006 UA216)	55200	1.45461191	0.315315715	6.7372854	340.7343512	42.8371797	299.2024702
4270	(2006 UM216)	55200	2.68169911	0.520091602	15.6689592	145.4758124	251.7894619	281.4382853
4271	(2006 UN216)	55200	3.20503619	0.618487771	11.8533485	10.2844721	84.1044319	189.8036116
4272	(2006 UQ216)	55200	1.10374041	0.162486949	0.4726197	247.4042362	217.898763	215.8854588
4273	(2006 UR216)	55200	1.6744227	0.531963859	14.2440818	134.1275874	21.6348384	136.4488263
4274	(2006 UC217)	55200	1.4899217	0.668623672	41.0392939	311.456946	217.2771308	227.5045824
4275	(2006 UL217)	55200	1.43039268	0.348852596	9.9201238	309.9956097	45.2855851	329.9186982
4276	(2006 UP217)	54040	1.20323921	0.48960009	1.5197127	82.8891951	206.8743629	50.5838085
4277	(2006 UQ217)	55200	3.00354807	0.585599684	22.2145203	240.1105392	84.8603876	247.9506034
4278	(2006 UR217)	55200	2.73760825	0.612547299	17.5938323	304.9738706	64.3195198	258.2404916
4279	(2006 VB)	54041	1.7293675	0.424785898	8.6944732	325.0595838	37.00776	14.3382966
4280	(2006 VC)	55200	1.94178435	0.491674327	12.2543748	19.1785978	87.6148312	40.1884074
4281	(2006 VJ)	55200	1.46844087	0.201669009	17.3775526	194.0842182	219.4004978	273.6799016
4282	(2006 VA2)	55200	2.50757454	0.482261461	24.4422628	340.7492861	46.5565605	291.696726
4283	(2006 VB2)	54052	1.79193424	0.787757599	15.8251883	171.4535777	4.4354334	336.9378642

#	Object	Epoch	a	e	i	w	Node	M
4284	(2006 VC2)	55200	2.10338232	0.421567784	27.7300991	211.8344088	226.1150157	0.5510577
4285	(2006 VD2)	55200	2.57704893	0.60024479	9.0221346	241.8291679	121.1305044	282.504539
4286	(2006 VT2)	55200	1.26269294	0.723165026	31.7888389	152.54913	59.5138325	350.4182658
4287	(2006 VU2)	54053	2.3176297	0.548669834	2.1741524	172.439205	226.8387281	2.5473563
4288	(2006 VV2)	55200	2.38793238	0.604811823	23.7058694	145.0547909	9.8849833	276.4425205
4289	(2006 VW2)	55200	1.23589663	0.294663791	10.0457562	299.5813158	229.8766945	16.2777757
4290	(2006 VX2)	55200	0.93404467	0.29084278	9.8261066	126.4917195	47.3464769	81.0564066
4291	(2006 VY2)	55200	0.89246704	0.377191689	14.563568	327.0177407	231.2906037	149.185517
4292	(2006 VZ2)	54057	2.48371213	0.600154152	36.5398609	215.4236696	252.1643682	350.7304146
4293	(2006 VA3)	55200	1.60277672	0.678911651	53.3309623	307.7598924	313.0093858	153.8166961
4294	(2006 VB3)	55200	2.83515126	0.547767257	11.0279714	336.5621799	46.4664515	243.3437366
4295	(2006 VD13)	55200	1.94796913	0.484003176	11.7146056	162.8359289	314.0647557	28.0898216
4296	(2006 VE13)	55200	1.87388047	0.535839486	3.828694	305.7298524	52.6608179	95.8287035
4297	(2006 VF13)	54054	1.32146344	0.250512769	24.4239217	161.2477795	235.5762518	10.3437231
4298	(2006 VG13)	55200	0.81764908	0.303627159	5.8594821	115.2145956	96.6437196	295.4055317
4299	(2006 VP13)	54058	1.17770878	0.142646742	11.0831656	234.3472127	231.0705246	322.7826765
4300	(2006 VQ13)	55200	1.09961975	0.445825283	16.6947749	73.7601732	233.775424	315.2455027
4301	(2006 VT13)	55200	2.57177631	0.630895916	2.2205642	40.5678238	324.4847788	281.8339027
4302	(2006 VY13)	55200	2.96725307	0.605362417	4.7504407	15.5378223	140.7954189	211.497538
4303	(2006 VB14)	55200	0.76678745	0.421406365	31.0199602	346.4521852	258.7658077	70.3025238
4304	(2006 VB45)	55200	1.22252431	0.164621495	12.4801602	171.1957303	234.5334823	120.6622654
4305	(2006 WA)	55200	1.4926281	0.142691583	28.2255502	270.420836	58.1680772	329.037316
4306	(2006 WB)	55200	0.84957895	0.180565914	4.9085081	162.4931544	65.4071069	192.7690616
4307	(2006 WU)	55200	1.78985149	0.355781764	2.9131802	208.4814511	332.3354967	11.3256929
4308	(2006 WV)	55200	1.53329024	0.533698693	2.1507021	80.7792415	56.3581662	206.2970978
4309	(2006 WW)	55200	2.69282377	0.863488453	33.0054486	197.502388	88.6188774	276.5026684
4310	(2006 WX)	55200	2.48307544	0.603129823	8.6866438	166.0541858	232.107969	291.4362436
4311	(2006 WN1)	55200	2.09971365	0.450769751	4.0146503	93.3305915	239.4258899	56.2611067
4312	(2006 WO1)	55200	2.7632404	0.530011228	9.4132768	113.9596618	223.5125932	276.9634621
4313	(2006 WP1)	55200	1.7057015	0.606631797	5.8930193	98.2467759	234.2583632	167.4249282
4314	(2006 WQ1)	55200	1.47488694	0.240419074	14.4117861	205.1513453	111.865628	338.3830785
4315	(2006 WR1)	55200	1.33318666	0.613992738	38.1602214	132.0365106	106.0693639	323.2162726
4316	(2006 WS1)	54063	1.23322842	0.467061938	18.0569819	320.6801436	311.7851618	66.5195243
4317	(2006 WT1)	55200	2.4703722	0.601180422	13.6827427	170.5476265	244.9549852	288.4407907
4318	(2006 WU1)	54060	2.27302017	0.513078957	7.5143404	311.1449071	60.0962584	11.9310617
4319	(2006 WV1)	55200	0.82809372	0.289104987	5.5678405	149.2973828	61.9816495	276.342153
4320	(2006 WW1)	55200	1.41831417	0.504617091	9.3939315	322.4002061	240.4809261	224.6464141
4321	(2006 WX1)	55200	0.91696283	0.300368147	11.6428835	290.9485856	328.0794037	9.5255213
4322	(2006 WY2)	55200	0.98339512	0.332890737	27.5516908	159.972204	99.8873864	185.3602712
4323	(2006 WZ2)	55200	1.69430064	0.330112859	24.6607059	65.8871952	354.453775	189.1027981
4324	(2006 WA3)	54059	1.22296196	0.197476985	23.9844132	47.8706309	234.7096661	111.1656842
4325	(2006 WB3)	54059	1.36968906	0.244292525	19.678806	172.8959277	234.989188	5.6960643
4326	(2006 WJ3)	55200	1.75224852	0.424174891	15.3563074	178.3935539	232.6360399	125.2612821
4327	(2006 WK3)	55200	1.64647648	0.30298217	18.6288441	292.6173201	84.7570494	207.5526704
4328	(2006 WL3)	55200	1.35771847	0.24090869	20.3916541	67.0919897	81.3697443	306.1604733
4329	(2006 WM3)	54064	1.98895354	0.547709353	2.0122722	36.3411259	89.8734283	342.305839
4330	(2006 WN3)	55200	1.80406298	0.503575731	25.9790179	294.3841017	245.1906505	39.966213
4331	(2006 WO3)	55200	0.79975637	0.44741268	21.2129009	9.6637602	252.6640969	272.6868071
4332	(2006 WP3)	55200	1.35669773	0.33967384	7.430336	141.0650266	221.2146275	19.9218192
4333	(2006 WX3)	55200	2.70485479	0.639023653	14.6810403	123.2153814	244.4404992	262.3057873
4334	(2006 WY3)	54061	2.42375618	0.646680601	2.7395421	323.450122	9.3757691	19.7617441
4335	(2006 WZ3)	55200	1.74696233	0.57726229	3.8054307	0.1565857	176.3611244	82.1437999
4336	(2006 WE4)	55200	0.78469234	0.183034853	24.7675692	318.6186566	311.054423	12.3175443
4337	(2006 WQ29)	55200	1.60086124	0.393437369	8.0684134	136.4682535	112.0737093	7.458888
4338	(2006 WR29)	54064	2.38834135	0.554282492	11.9802623	197.5158651	243.5233594	355.8402083
4339	(2006 WS29)	54064	1.6610289	0.457264305	14.5293299	56.7893602	63.8762334	338.7400119
4340	(2006 WT29)	55200	1.71697116	0.312842922	31.5915868	156.9307105	259.6246699	151.743083
4341	(2006 WU29)	55200	2.6204815	0.526191581	28.9263611	336.8082868	96.1330532	258.7122543
4342	(2006 WV29)	54063	1.3802814	0.55902911	1.1988071	82.0297382	75.3402003	326.7350122
4343	(2006 WX29)	54063	2.33295206	0.730142942	2.558586	96.2973767	239.3023779	13.2306372
4344	(2006 WZ29)	54064	2.27011045	0.573605471	4.8604631	143.8299096	226.8880534	12.735789
4345	(2006 WA30)	54063	1.6306566	0.422240401	10.085656	226.6643112	241.5529478	341.7406535
4346	(2006 WB30)	54067	1.64395274	0.361481073	3.6378347	359.7934573	70.6025944	358.1123264
4347	(2006 WC30)	55200	2.59834084	0.622598121	4.9759609	13.6058636	72.3165127	263.5498087
4348	(2006 WP127)	55200	2.53201608	0.767344989	6.0796944	22.9158249	178.3329883	240.7702849

#	Object	Epoch	a	e	i	w	Node	M
4349	(2006 WQ127)	54065	1.30922071	0.508509504	18.0738089	87.4130912	73.5810407	320.8536164
4350	(2006 WR127)	55200	0.90711454	0.375943773	16.7868651	351.422127	260.8529619	42.5780703
4351	(2006 WD129)	54065	1.88192248	0.500895078	6.0271512	319.4382192	56.8136868	14.3082024
4352	(2006 WE129)	55200	1.7271451	0.48163956	39.5238298	109.9048762	64.3901715	75.915391
4353	(2006 WF129)	55200	2.64694562	0.530892281	21.9031442	124.9389127	269.2073413	275.0469049
4354	(2006 WG129)	55200	1.76134783	0.424812504	11.0549337	211.8779221	276.2183885	102.0449567
4355	(2006 WG130)	54067	2.40054425	0.59817988	11.2627509	325.3724194	64.0679843	7.5634354
4356	(2006 WH130)	55200	1.30414998	0.180664613	17.0424242	18.6371727	66.9661212	14.9265404
4357	(2006 WJ130)	55200	1.1335091	0.134943477	22.4025538	130.1150472	244.7851279	244.8609012
4358	(2006 WK130)	55200	2.10552868	0.682424755	13.7956555	276.8836011	72.2120954	21.0813618
4359	(2006 WO130)	54066	1.6629749	0.456077914	12.2461868	230.406373	246.4320491	340.6126725
4360	(2006 WZ184)	55200	1.36657909	0.328525834	0.8429588	127.8469947	249.6699302	2.9336324
4361	(2006 XA)	55200	2.19697694	0.548519492	10.2943923	300.6897765	253.1101931	313.7787273
4362	(2006 XB)	55200	1.748718	0.497350801	6.8425321	13.1087035	143.6838446	85.6434569
4363	(2006 XW)	55200	1.10199844	0.037285375	8.2110878	230.089053	75.9035265	4.4998069
4364	(2006 XX)	55200	2.53702588	0.5815951	5.237375	337.4712903	81.3549603	278.3143111
4365	(2006 XY)	55200	1.49801443	0.338393643	3.6380789	184.0738456	257.9633563	239.8831398
4366	(2006 XF1)	55200	1.35812943	0.536587956	32.188106	46.6696772	264.9092584	30.0425328
4367	(2006 XG1)	55200	2.46189004	0.593450854	20.4082968	343.8633633	38.6399666	292.628108
4368	(2006 XH1)	55200	2.36244924	0.453199636	6.2911248	183.6849277	278.9348582	297.3366171
4369	(2006 XJ1)	55200	1.26215841	0.160563103	17.4077937	135.1400473	269.6310942	85.0592223
4370	(2006 XK1)	54083	2.49999283	0.698522817	13.1236851	173.3592236	329.8345929	347.9133659
4371	(2006 XD2)	55200	1.26789731	0.425486692	3.5678034	109.3107791	65.7340711	6.1674481
4372	(2006 XE2)	55200	1.15056339	0.309992967	20.0241146	70.075161	268.1450273	242.049596
4373	(2006 XF2)	55200	2.18917319	0.490607402	26.9512269	45.4863516	78.7985653	328.687856
4374	(2006 XG2)	55200	1.3415078	0.140209557	20.1172235	189.7830168	81.3836326	156.0464662
4375	(2006 XH2)	54083	2.29092587	0.736034761	2.0325838	297.4471898	51.2215515	14.6126552
4376	(2006 XJ2)	54084	1.66406187	0.343626544	8.6941375	157.0294911	257.8385024	12.1163167
4377	(2006 XK2)	55200	1.54013949	0.647791226	8.669058	240.2767061	93.2858407	256.5821228
4378	(2006 XX2)	55200	0.9857704	0.310575061	17.6436869	67.6395064	260.6678163	121.7311779
4379	(2006 XY2)	55200	1.52565928	0.248082821	13.9774844	209.3309616	266.3287205	206.5837834
4380	(2006 XZ2)	55200	1.69587558	0.465889213	0.3024733	12.8945104	120.1712616	120.2552368
4381	(2006 XA3)	54084	2.35976742	0.6223618	4.978342	308.5354721	84.8833505	10.4650921
4382	(2006 XN4)	54087	2.60298211	0.61005896	6.6713375	191.7080444	260.4014903	359.055574
4383	(2006 XO4)	55200	0.83909297	0.301059132	8.4670951	29.0594026	266.8245527	120.4050556
4384	(2006 XP4)	55200	0.8725095	0.213858611	0.5376514	343.3026594	296.7646742	70.9958761
4385	(2006 XQ4)	54086	1.47502708	0.297136109	6.1615147	182.6860442	261.0378417	0.1507887
4386	(2006 XR4)	55200	1.04061383	0.269335692	10.9478228	275.1919773	263.1168397	251.3070666
4387	(2006 XV4)	55200	2.59119067	0.625539565	3.985102	159.3411636	259.1239102	268.3870711
4388	(2006 XW4)	55200	1.04231746	0.086208943	13.3061234	261.5336954	79.9480262	44.656527
4389	(2006 YA)	55200	1.73768259	0.424355376	15.4441283	28.0051282	92.2326048	104.9926198
4390	(2006 YB)	54089	2.06597475	0.511074712	4.4226313	44.750566	75.5580567	351.4111339
4391	(2006 YD)	55200	2.62237505	0.693811602	7.7350811	352.0655505	223.4210061	239.2043799
4392	(2006 YE)	55200	1.74493566	0.440021821	0.319219	210.5469143	253.4452944	109.4226521
4393	(2006 YF)	55200	1.10889706	0.19909964	4.6719044	26.9554945	274.4960809	1.3845898
4394	(2006 YM)	55200	0.89795038	0.123478195	12.8802707	171.0326945	86.4528089	40.8765405
4395	(2006 YN)	55200	1.47750586	0.224904539	15.273606	307.7393478	106.327002	275.5990256
4396	(2006 YP)	55200	1.14438761	0.210663918	5.3776982	95.1650344	69.4346762	121.8771457
4397	(2006 YU1)	55200	2.65485252	0.552031969	8.1927712	190.8709067	292.7704059	244.7145065
4398	(2006 YV1)	55200	1.25546588	0.44280346	4.9729607	49.5441048	303.0370758	105.9323833
4399	(2006 YH2)	54091	1.96983461	0.450987048	4.3718887	342.5637849	91.4598684	5.01879
4400	(2006 YJ2)	55200	1.77022292	0.417667377	10.7447443	318.8422532	107.8901153	111.7758821
4401	(2006 YR2)	55200	2.48013068	0.581924731	8.937631	174.5225456	245.8319201	285.7740724
4402	(2006 YX2)	54092	1.00830719	0.165823326	28.6897279	245.1588733	88.6207255	97.9146555
4403	(2006 YY2)	55200	1.99207364	0.406568768	31.4414793	68.4256743	105.2533905	350.4560894
4404	(2006 YD12)	55200	1.84543968	0.446932198	3.8808962	200.8887755	283.3592817	64.783786
4405	(2006 YC13)	55200	1.46282926	0.377682206	25.2424124	277.3809003	290.0790327	204.0889879
4406	(2006 YF13)	55200	0.91891287	0.40345811	10.5317198	95.3500254	205.351946	276.6032677
4407	(2006 YT13)	55200	1.32330841	0.425907365	38.2393932	105.4468015	116.7816724	307.6865646
4408	(2006 YH14)	55200	1.85258161	0.421319139	8.3539029	185.0899399	293.3083283	63.1254338
4409	(2006 YO44)	54097	8.21581293	0.963713226	20.0106118	263.9422125	355.1995817	357.4609206
4410	(2006 YP44)	55200	2.54340773	0.626144287	1.9849945	333.0339168	88.2344514	274.5072279
4411	(2007 AG)	55200	0.72031217	0.374437342	11.9396103	5.6091835	283.2917679	129.5311
4412	(2007 AM)	55200	0.79867332	0.467171944	11.7210678	172.5018698	107.1763135	255.6976989
4413	(2007 AA2)	55200	1.03257117	0.12071094	10.5473161	96.1814317	287.8760817	14.1693658

#	Object	Epoch	a	e	i	w	Node	M
4414	(2007 AB2)	55200	1.918001	0.545782573	1.4585791	280.5837482	127.1499321	62.2562798
4415	(2007 AC2)	55200	2.41846425	0.741896853	9.5066618	90.5347688	294.9916212	298.0968311
4416	(2007 AF2)	55200	1.72067775	0.421970191	17.0353841	211.6725722	289.7166652	101.3574795
4417	(2007 AS2)	55200	2.58949393	0.624079489	3.761708	121.463689	308.4501237	265.0336342
4418	(2007 AT2)	55200	1.69287273	0.375678401	13.6493429	215.464259	294.2112631	107.8056057
4419	(2007 AU2)	54111	1.61029007	0.488824137	6.4901195	66.4226941	110.1713296	337.3360291
4420	(2007 AV2)	55200	1.43743609	0.473844825	12.296146	293.1779983	286.0189345	210.9753975
4421	(2007 AA9)	55200	0.85814839	0.420479001	6.7930046	55.7907465	271.0003265	15.0138914
4422	(2007 AB12)	55200	2.30349578	0.718166171	7.7744626	281.7878404	66.5905809	317.7913244
4423	(2007 AC12)	55200	2.77624175	0.54885367	24.0590704	2.6549488	51.5586783	231.0160924
4424	(2007 AG12)	55200	2.08989624	0.656200037	42.0280537	68.0878546	305.6214163	33.562187
4425	(2007 AH12)	55200	2.04355046	0.453200554	10.4540358	0.6540561	126.6150812	2.7482432
4426	(2007 AS12)	55200	1.50994579	0.244026363	21.0119076	266.8003246	126.3501905	272.4528157
4427	(2007 BA)	55200	1.69802293	0.310106097	12.821763	204.5982183	293.3016986	102.5601334
4428	(2007 BB)	55200	0.93250071	0.141487103	3.5290464	301.6042191	297.9597186	356.6547566
4429	(2007 BD)	55200	0.73336782	0.344594198	9.2683702	359.1664427	297.589684	79.3465805
4430	(2007 BG)	55200	0.78664518	0.330787512	12.737795	133.3186709	168.419692	250.1854838
4431	(2007 BJ)	54121	2.94225269	0.679756557	44.0278543	133.8971233	298.6745123	7.4517999
4432	(2007 BS2)	55200	1.5769871	0.291434115	6.5191882	9.1630054	113.992842	177.2628611
4433	(2007 BT2)	55200	1.63258735	0.223884018	26.8557892	148.9421379	31.0395518	135.8278553
4434	(2007 BD7)	55200	1.56158324	0.498019747	4.8542784	219.7206598	343.7194001	153.3488664
4435	(2007 BT7)	55200	2.17202892	0.539357732	17.4252352	116.968677	294.8940511	348.5867852
4436	(2007 BU7)	54126	0.94502004	0.336740597	21.1460249	241.5797595	120.3185515	86.1175025
4437	(2007 BC8)	55200	2.04955328	0.500853507	2.17876	147.7980999	10.9325479	351.5637829
4438	(2007 BD8)	54130	1.43350632	0.42107967	4.4394243	267.0019075	300.9600856	324.2891095
4439	(2007 BM8)	55200	1.3415788	0.720639899	27.6301541	179.2154922	87.670951	264.2395884
4440	(2007 BG29)	55200	0.83257752	0.334677116	18.5106744	245.103432	61.0427472	175.713397
4441	(2007 BJ29)	55200	2.18146679	0.825875688	11.0497489	119.1501881	242.409606	343.9930477
4442	(2007 BX48)	55200	1.38648034	0.359789964	14.8104552	8.0363826	303.0966014	91.6834299
4443	(2007 BY48)	54127	1.39773333	0.287327833	25.127672	156.9815636	301.9105408	15.0049117
4444	(2007 BZ48)	55200	1.78812478	0.467553354	0.6766592	53.8038581	114.0317842	67.9870048
4445	(2007 BA49)	54129	2.70253342	0.615053979	1.0835011	323.943941	120.945014	4.6541765
4446	(2007 BB49)	55200	2.17868217	0.46421997	18.2609106	95.2403112	327.3342154	359.0680483
4447	(2007 BE49)	55200	1.56732873	0.592062964	6.0385884	10.7781308	15.8256034	210.9612208
4448	(2007 BG49)	55200	1.8440121	0.32077132	7.8947495	281.4219635	332.9445016	329.0460827
4449	(2007 BB50)	55200	3.07545961	0.590103494	15.4942277	325.7189645	145.8763034	200.8760293
4450	(2007 BF72)	55200	1.43263025	0.215584336	4.104925	303.6528482	49.4468896	23.4216327
4451	(2007 CO5)	55200	1.67744877	0.308626877	47.942128	327.9597808	138.5090755	137.656357
4452	(2007 CP5)	54141	1.65378409	0.357782554	35.9651854	41.4132035	137.9491316	342.7023277
4453	(2007 CQ5)	55200	1.54101716	0.287898885	4.64367	130.8520199	49.3377647	166.0703658
4454	(2007 CR5)	55200	1.61789425	0.444754531	13.8654334	310.68251	138.8757609	166.2398188
4455	(2007 CS5)	55200	0.98015049	0.172674899	0.7452865	261.3901328	125.5434119	87.1427121
4456	(2007 CH15)	55200	1.38032079	0.284962751	25.8908867	114.7175041	139.1116719	204.8462722
4457	(2007 CJ15)	54145	1.45873926	0.312614766	14.5158715	206.51736	325.6100533	345.8218774
4458	(2007 CU18)	54142	2.02771563	0.539896045	7.0384099	320.2467118	133.4397078	13.1844188
4459	(2007 CA19)	55200	2.78717139	0.826347412	9.621782	97.6137146	174.8141904	203.5140867
4460	(2007 CB19)	55200	1.6246384	0.363166136	18.682439	273.8702599	143.4481045	186.6911321
4461	(2007 CC19)	54142	1.65852934	0.626976713	2.1910785	273.8439039	317.8716704	336.7762578
4462	(2007 CF19)	55200	2.98518966	0.630719372	18.1129052	244.4050033	321.5079334	187.0810633
4463	(2007 CK26)	55200	1.79619646	0.463586539	32.3916321	97.4980935	147.4148656	25.4503537
4464	(2007 CL26)	55200	1.60046057	0.395779656	11.4113454	123.471336	316.6097006	181.9038519
4465	(2007 CM26)	55200	0.94244058	0.180073041	7.1444133	152.3518052	142.7058468	276.5570282
4466	(2007 CN26)	55200	1.29483049	0.270097399	7.5707291	135.769169	159.4296646	212.5790545
4467	(2007 CO26)	55200	2.79710064	0.617171601	7.1394089	145.1384265	351.083969	219.8641335
4468	(2007 CS26)	55200	2.33040964	0.5680783	21.9519639	24.1173529	143.73228	286.7145512
4469	(2007 CT26)	55200	0.85510339	0.386979081	2.8971068	44.4358018	321.7559196	334.7182214
4470	(2007 CA27)	55200	0.86554196	0.343634462	29.9316787	200.0404252	122.9980548	31.3679779
4471	(2007 CB27)	55200	1.1196669	0.061783153	19.5106018	178.9952677	327.2122221	157.7295442
4472	(2007 CC27)	54147	1.68547817	0.492086403	2.1166179	124.9754075	324.252075	19.4009966
4473	(2007 CZ49)	55200	2.93790258	0.63038247	10.9270492	155.350861	318.2189262	211.627953
4474	(2007 CX50)	55200	1.20756259	0.226161153	7.4986928	126.095514	322.6126445	100.231276
4475	(2007 DA)	55200	1.00973554	0.573648792	2.7594627	261.9186918	117.4174963	6.313284
4476	(2007 DC)	54150	1.35157875	0.324314208	0.4076344	278.0700991	174.8855878	30.1503822
4477	(2007 DD)	55200	0.98984043	0.116330731	2.5255082	75.6054742	330.9285454	61.0854303
4478	(2007 DJ)	55200	1.86791891	0.476352033	6.943799	29.1897883	157.5282142	32.9849632

#	Object	Epoch	a	e	i	w	Node	M
4479	(2007 DK)	55200	1.39624206	0.55042798	5.1767749	354.9015812	290.9797317	193.1849921
4480	(2007 DW)	55200	1.07918763	0.524742801	38.6827626	313.2537321	328.1445716	121.4215077
4481	(2007 DX)	55200	2.61655561	0.541670092	4.6409896	198.009356	336.1261868	238.9961472
4482	(2007 DY)	55200	2.44256731	0.594819779	37.5739569	282.1317958	159.9914768	288.9137582
4483	(2007 D57)	55200	1.18008646	0.3997901	8.4485177	270.7801962	148.5048262	132.9241394
4484	(2007 DE8)	54153	0.87200797	0.309664867	12.9762497	327.4634785	327.1494286	238.831192
4485	(2007 DF8)	55200	1.82134227	0.452817975	9.1012604	130.1252903	102.2794609	25.7472596
4486	(2007 DG8)	55200	1.35944472	0.37429095	3.0656281	90.0021631	132.0300632	257.3385592
4487	(2007 DH8)	55200	1.43706631	0.263381489	4.4513252	356.1904364	149.5636142	241.7347907
4488	(2007 DJ8)	54154	1.6295948	0.361573494	29.7689383	154.6475917	332.16918	12.3138586
4489	(2007 DK8)	55200	1.64990231	0.419171367	32.576062	98.9995609	155.1857463	80.0447957
4490	(2007 DL8)	55200	2.66228438	0.765707412	18.8094696	132.783498	157.4910389	196.8872281
4491	(2007 DM8)	55200	0.98769713	0.367309614	7.5370901	61.3120436	332.6174252	48.6115196
4492	(2007 DQ40)	54158	2.00408228	0.634966595	1.8798205	312.5453106	122.3285245	19.8319437
4493	(2007 DX40)	55200	1.53379329	0.536987577	0.4486084	273.9207492	329.694043	152.1578425
4494	(2007 DY40)	55200	1.71733993	0.591848934	5.8786615	114.7437161	160.4356596	52.8229741
4495	(2007 DZ40)	55200	2.84819709	0.698397034	11.2832825	8.7443831	172.932048	206.9879994
4496	(2007 DL41)	55200	1.45673609	0.476212582	4.6737818	139.960158	150.9628029	139.6611235
4497	(2007 DM41)	55200	1.18204191	0.527662454	2.2737804	274.2440395	1.9473498	28.1687286
4498	(2007 DN41)	55200	2.88192752	0.685976601	2.4329052	316.7615586	153.3541079	217.7508203
4499	(2007 DD49)	55200	2.17342777	0.605219142	8.199011	277.1258024	150.2663263	339.4337363
4500	(2007 DB56)	55200	2.02934155	0.36046469	7.7198448	122.1687738	349.0492983	18.2895915
4501	(2007 DX60)	55200	1.34867181	0.139763451	8.2959295	278.5304033	340.7811687	212.4245305
4502	(2007 DB61)	55200	0.81147859	0.364240031	5.3757349	209.0927344	159.3530965	85.9764001
4503	(2007 DB83)	55200	1.75063996	0.299952731	10.9028102	162.175255	55.3168735	51.1242405
4504	(2007 DS84)	55200	1.86676894	0.4458402	8.9079583	172.5661972	30.6928103	25.4368377
4505	(2007 DT103)	55200	2.20887991	0.57344074	5.4447072	134.0277215	137.1883145	275.3204464
4506	(2007 DU103)	55200	2.46324821	0.501163785	23.1095045	293.738091	338.8930949	206.5363382
4507	(2007 EC)	55200	0.92695833	0.196263734	5.8113799	45.7551043	307.9250922	230.2302707
4508	(2007 EF)	55200	0.82060147	0.409800187	21.7379815	226.0265704	158.4177894	25.2539772
4509	(2007 EG)	55200	0.75475153	0.368113063	3.148298	168.8303887	166.4852605	316.469229
4510	(2007 EH)	55200	2.16626047	0.656995969	1.3901813	246.0379666	352.7747304	305.2888147
4511	(2007 EJ)	55200	2.50080209	0.629759026	8.3318363	3.6497627	61.8390624	269.2103029
4512	(2007 EK)	55200	1.126276	0.272264141	1.2063371	83.2567242	168.5800396	77.1619651
4513	(2007 EL)	55200	1.4966187	0.275965894	34.3257579	299.2985578	357.3085208	103.4181862
4514	(2007 EM)	55200	1.96232757	0.380289784	23.9906703	14.0939838	180.7889663	356.5668164
4515	(2007 EN)	54170	2.59780803	0.589427821	24.1087312	256.3658413	338.9198397	339.964464
4516	(2007 EO)	55200	1.9065897	0.457477839	5.4549953	349.5504584	190.8383843	22.4535979
4517	(2007 EQ)	55200	1.62920831	0.44788238	5.6690662	3.0999635	106.4859128	151.9679188
4518	(2007 ES)	54171	1.57975471	0.601253938	35.5399371	19.6992917	334.44278	97.5956965
4519	(2007 EU)	54171	1.44566577	0.306985414	13.2615315	334.5176925	164.1643745	16.5726249
4520	(2007 EV)	55200	1.09116915	0.30801903	8.1786019	268.5139904	357.4281537	109.4270733
4521	(2007 EW)	55200	2.63295764	0.573460727	24.6082727	84.3304408	37.507526	251.0033405
4522	(2007 EX)	55200	0.87147245	0.417544136	18.6939797	78.8412476	297.5148577	283.1376622
4523	(2007 EY)	55200	2.34824251	0.538159747	16.296794	120.2536666	32.9501149	287.4476751
4524	(2007 EZ)	55200	1.70696998	0.572630564	5.8103257	357.8490526	98.5414285	116.9579713
4525	(2007 EY25)	54172	1.83926951	0.613422808	2.2665738	265.4786351	346.6870361	339.4637971
4526	(2007 EZ25)	54171	2.15428919	0.722730594	5.4849632	267.9218619	167.9261512	16.5530031
4527	(2007 EA26)	54173	2.72694259	0.631021174	6.1264326	87.1150211	356.6036745	24.4242623
4528	(2007 EB26)	54171	0.54827753	0.786763682	8.461346	236.9163832	62.9536123	240.4396389
4529	(2007 EE26)	55200	1.24708977	0.241594274	1.0344202	122.5131308	343.1430959	49.8515511
4530	(2007 EG26)	55200	1.18479963	0.155133588	28.1046947	21.51242	168.2166271	52.9872014
4531	(2007 EH26)	54171	1.90053887	0.669488636	5.6317988	268.8033269	356.40752	339.6827687
4532	(2007 EJ26)	55200	1.64140801	0.268770283	29.0451093	224.3292209	176.4061525	224.4026434
4533	(2007 EK26)	55200	1.84962772	0.652218013	3.4278444	98.1509968	346.5328501	62.1559918
4534	(2007 EL26)	54170	1.27098497	0.115273346	13.7179826	229.4001353	344.3815411	319.954211
4535	(2007 EM26)	54173	1.4662961	0.218752497	26.7018895	342.781931	169.2276548	11.3100678
4536	(2007 EN26)	55200	1.29524507	0.329047136	15.4822181	246.3945071	9.1856436	281.5996146
4537	(2007 EF88)	54174	2.47680573	0.568580299	7.0220728	322.7842403	168.161031	8.8158598
4538	(2007 EG88)	54175	1.62085456	0.376961946	1.0213662	26.6439445	168.9805868	350.889984
4539	(2007 EH88)	55200	1.12258416	0.441284511	12.0905045	324.2478303	3.8597804	349.0065019
4540	(2007 EJ88)	54178	2.32886577	0.777545161	1.9142845	204.822988	79.7185625	343.2841406
4541	(2007 EK88)	55200	1.73667989	0.351224072	14.8095776	33.1190128	181.2975784	65.7179626
4542	(2007 EL88)	55200	1.11954212	0.522036149	30.8368476	116.1306173	198.5148292	62.7426645
4543	(2007 EM88)	55200	1.65068484	0.26767764	3.5772917	336.9640136	78.2843415	218.6984213

#	Object	Epoch	a	e	i	w	Node	M
4544	(2007 EN88)	54175	2.1752246	0.587190011	8.8956146	135.1009817	354.0567789	10.5738488
4545	(2007 EO88)	55200	1.12945621	0.336756938	5.9584452	270.5178351	356.2662321	67.9415027
4546	(2007 EP88)	55200	0.83732721	0.885851789	20.7897293	46.9521911	328.6697584	355.1903942
4547	(2007 ED125)	55200	1.92515327	0.584840747	3.7589358	290.287152	173.5366915	39.4805707
4548	(2007 EE126)	54175	3.59536041	0.902598907	8.5308326	249.2027961	169.8649984	6.5480563
4549	(2007 EF126)	55200	2.460615	0.598413536	9.4393976	283.4592013	173.7749259	291.2497023
4550	(2007 FA)	55200	1.25033439	0.265799192	16.3267879	135.3485962	156.4806028	284.9052522
4551	(2007 FB)	54176	1.31235077	0.263263109	5.8136863	311.1159858	171.9313236	31.6171906
4552	(2007 FC)	54176	1.71402012	0.424907836	4.6585506	314.7178279	175.6680162	18.0024979
4553	(2007 FD)	55200	2.0598187	0.601549756	6.944077	183.4445614	222.5764449	62.012648
4554	(2007 FE)	55200	1.79401477	0.457219704	6.988901	135.0192599	122.7548176	35.3999854
4555	(2007 FE1)	55200	2.02101905	0.545708409	9.8381297	193.1052288	44.8210908	323.7640849
4556	(2007 FF1)	54181	1.52291245	0.483868937	8.2523057	234.4279127	21.7572116	327.6922396
4557	(2007 FG1)	55200	1.94577714	0.478352079	9.2786166	6.9350387	175.4175749	9.5683488
4558	(2007 FH1)	55200	1.7286664	0.386395039	22.7734178	228.7102658	0.7532014	56.7714223
4559	(2007 FI1)	55200	1.79865008	0.401911897	3.3316632	50.1019435	130.419002	56.188643
4560	(2007 FK1)	55200	2.48261857	0.575503957	3.3195385	115.9008991	132.738704	240.1043466
4561	(2007 FL1)	55200	2.35330234	0.50413525	28.6188439	172.2126432	72.3467895	263.3055773
4562	(2007 FC3)	55200	1.34389504	0.315096372	25.1820569	228.775043	358.8498739	260.1675508
4563	(2007 FD3)	55200	2.21883153	0.53415873	33.8541068	140.4910611	20.6837112	309.3279702
4564	(2007 FK3)	55200	2.31037194	0.453272868	7.0472221	328.5645227	143.215347	317.0062455
4565	(2007 FN3)	54180	0.99155182	0.264802422	48.4353006	138.5411275	177.6077372	245.5979066
4566	(2007 FO3)	54180	1.27021939	0.297388307	6.3095825	262.0741709	356.8562238	311.7713155
4567	(2007 FP3)	54180	1.41376376	0.403617141	0.23735	119.5892719	352.428324	30.2310805
4568	(2007 FQ3)	54180	2.27935524	0.535729445	1.9403688	2.798137	182.8619354	358.4337241
4569	(2007 FR3)	54180	1.85870307	0.504476634	1.625413	43.09084	182.5791378	345.902371
4570	(2007 FS3)	55200	1.58121588	0.416597514	3.2572366	313.2799269	179.4549155	163.2223855
4571	(2007 FT3)	54180	1.12526098	0.305753467	26.7277672	277.6123824	9.8422516	297.3192066
4572	(2007 FL18)	54182	3.27857746	0.633382026	26.2286455	132.7251832	333.4071849	9.5057213
4573	(2007 FE20)	55200	1.75368653	0.272741771	7.6107083	279.2865926	282.4159033	65.098247
4574	(2007 FY20)	55200	1.45857589	0.386943326	5.3761036	230.2577919	11.9800738	181.4067862
4575	(2007 FS35)	55200	1.92211327	0.390150774	0.3175019	107.0281746	183.2761418	317.1692645
4576	(2007 FV42)	55200	2.17590819	0.472700736	9.8339588	181.671099	101.0634718	281.236872
4577	(2007 GC)	55200	2.00361679	0.456879864	8.1441509	59.7186346	193.0897658	325.595013
4578	(2007 GF)	55200	1.30096146	0.378516464	18.8769293	32.9705799	59.0242678	9.4104225
4579	(2007 GG)	55200	2.65407793	0.557971262	5.2890213	299.5064833	137.2940901	241.7301856
4580	(2007 GU1)	55200	2.18222785	0.638439079	9.1151934	243.372295	25.9623918	291.1342186
4581	(2007 GY1)	55200	1.97308319	0.600564993	1.1927588	323.468824	163.7081247	12.7228271
4582	(2007 GQ3)	55200	1.8050844	0.450213181	10.2007636	209.538128	34.6057247	29.0241894
4583	(2007 GS3)	55200	1.06115526	0.129039081	15.089118	61.1401676	215.4699602	117.1106056
4584	(2007 GT3)	54205	1.99369603	0.939363231	25.4286666	341.8940188	15.7472466	341.8830601
4585	(2007 GS4)	54204	1.2888066	0.257219492	24.836184	74.7057025	28.2839373	77.9336644
4586	(2007 GU4)	55200	1.20214447	0.456327769	3.1526598	295.3505052	160.9441709	77.7420029
4587	(2007 GW4)	55200	1.07719262	0.290988921	29.482324	172.1698033	185.9077291	12.3224708
4588	(2007 GV5)	54205	2.36860803	0.823422223	21.2596711	307.8949447	15.431694	340.8735182
4589	(2007 GW5)	55200	1.4481038	0.287751524	23.8197195	261.0569138	32.7220586	152.5674136
4590	(2007 GX5)	54207	1.58041928	0.556943288	1.2380211	41.8022599	75.6081696	28.6820211
4591	(2007 GY5)	54206	1.50220525	0.393839435	24.7447119	246.9795853	26.4646646	327.721036
4592	(2007 GZ5)	55200	1.46741527	0.277667285	13.7756626	96.8481515	187.7901244	139.5039282
4593	(2007 GD49)	55200	2.54139058	0.4966222	30.8615249	296.506164	44.997496	180.4232975
4594	(2007 HA)	55200	0.89232726	0.470159242	32.9475095	133.1663291	205.8297309	359.0457669
4595	(2007 HB)	55200	2.10857162	0.397996831	23.2698668	103.7467995	67.4643258	336.22349
4596	(2007 HC)	55200	1.1556637	0.207541186	3.1562223	57.7827139	216.9366114	19.5363533
4597	(2007 HP)	54212	1.9745905	0.757269571	2.7880708	67.5234229	34.1287129	19.4500469
4598	(2007 HR)	55200	1.06686482	0.741521673	11.9765334	13.0053705	32.7968784	282.3191993
4599	(2007 HZ)	55200	1.32894922	0.142369787	7.4174996	259.0173232	208.4050467	359.1644953
4600	(2007 HW3)	55200	2.61946987	0.631851446	15.1275022	85.4312798	204.9969892	210.1894059
4601	(2007 HX3)	55200	1.52675327	0.312265888	6.1356107	342.686835	14.6956135	24.2978392
4602	(2007 HY3)	54209	1.38552719	0.245598868	9.5328458	190.0727719	29.7472782	354.153791
4603	(2007 HL4)	55200	1.11850342	0.089695398	6.5301551	138.5422442	31.18324	139.5976829
4604	(2007 HV4)	55200	1.84133621	0.472773714	4.2429588	30.1570666	209.6702035	20.5085788
4605	(2007 HW4)	54211	1.48377819	0.766384543	1.2395218	196.8008111	139.0078212	330.1906358
4606	(2007 HX4)	55200	1.31743305	0.331532357	56.5577125	14.4750433	41.6922861	21.2295467
4607	(2007 HB15)	55200	1.25190052	0.254575447	1.1106673	226.7720394	37.4153663	302.9999056
4608	(2007 HD15)	55200	1.28186319	0.276356005	15.0547648	310.0139858	204.3263487	345.1158407

#	Object	Epoch	a	e	i	w	Node	M
4609	(2007 HE15)	55200	2.14515632	0.540392244	9.5414998	342.2777692	297.8207167	287.7343702
4610	(2007 HF15)	55200	2.86252318	0.552635922	8.2673409	126.4668913	56.6842537	207.7874175
4611	(2007 HY15)	54214	1.41818309	0.211728381	22.5442999	9.4854878	208.8670629	356.5285382
4612	(2007 HF44)	55200	1.60029054	0.315137668	2.9915783	314.0446075	116.4211651	241.3814981
4613	(2007 HG44)	55200	2.47303677	0.71824835	8.3861733	33.2016567	64.5847472	269.7817686
4614	(2007 HH44)	54218	2.42414951	0.570866981	1.7424727	71.2213226	173.4844847	353.6595415
4615	(2007 HZ58)	54216	2.09781271	0.538880381	6.5594305	58.44011	202.8440527	347.7198419
4616	(2007 HA59)	55200	2.51086902	0.726162771	54.694186	17.502342	57.1854044	333.0397232
4617	(2007 HD70)	55200	2.1155209	0.473168446	5.6584654	82.0531588	161.4190921	308.2369779
4618	(2007 HX82)	55200	2.64957739	0.546423357	8.2591104	93.0884455	181.2418007	210.1543216
4619	(2007 HD84)	54220	2.45371761	0.53712983	4.6687402	173.5475855	50.9809555	358.1368027
4620	(2007 JD)	54229	2.82414145	0.812241341	12.264252	93.1398354	228.8486951	350.2391364
4621	(2007 JX2)	55200	1.70788133	0.527033066	4.2219737	87.6754503	44.54926	96.957866
4622	(2007 JY2)	55200	2.19993046	0.688057993	1.5950724	105.0555123	225.7520044	269.4195345
4623	(2007 JZ2)	54230	1.84898254	0.537112878	6.7554138	242.4605443	48.8458591	341.7529271
4624	(2007 JW9)	54233	2.02395184	0.440075711	2.4920212	334.9484839	230.9579581	8.8801377
4625	(2007 JF16)	54235	2.02186524	0.675821984	44.0933888	221.0926013	225.5998175	63.4609468
4626	(2007 JG16)	55200	1.65697176	0.357661199	4.264064	48.0333268	222.7589571	69.7197059
4627	(2007 JZ20)	55200	1.31145931	0.335485886	40.474538	139.0033749	200.5252736	210.8276985
4628	(2007 JB21)	55200	0.9867986	0.108957489	13.443207	250.4672291	227.9264792	354.2179253
4629	(2007 JF22)	55200	3.09322244	0.584650355	24.7868536	124.1174849	48.7365058	174.1763363
4630	(2007 JH22)	55200	2.1800771	0.607372882	5.5707733	22.7163107	150.9873845	309.5170066
4631	(2007 JJ35)	55200	1.77366891	0.305093359	56.0574622	324.0967312	230.6431885	59.0860607
4632	(2007 JE40)	55200	1.92810991	0.37279515	19.5044972	67.5461403	213.2402195	335.9925802
4633	(2007 KD)	55200	1.95858008	0.418285269	11.2197504	241.8896277	44.2092024	323.9450424
4634	(2007 KE)	55200	1.6792904	0.524224427	9.2171526	78.4480114	81.2098787	101.473922
4635	(2007 KJ)	55200	2.39515651	0.579577389	9.0310803	242.6111679	94.7668056	219.4848693
4636	(2007 KK)	55200	1.46021402	0.263689333	5.5341251	110.8497174	105.7506662	189.8580472
4637	(2007 KD2)	55200	2.77587379	0.597821174	2.5914893	76.0576141	187.9168953	198.5933366
4638	(2007 KV2)	55200	1.1162893	0.312813085	13.7216654	264.5094583	235.5514689	144.1108892
4639	(2007 KW2)	55200	2.29337875	0.524857977	10.072273	18.3110836	224.960862	271.2008924
4640	(2007 KE4)	55200	2.38374951	0.571243868	9.339803	194.594269	65.0748055	252.0620803
4641	(2007 KN4)	55200	3.339309	0.631632776	12.5470911	51.2561768	232.4822535	157.8529466
4642	(2007 KO4)	54243	1.10317968	0.161725957	25.1485361	299.3201336	61.167149	253.0755983
4643	(2007 KF7)	55200	1.71765302	0.385956877	11.8526919	185.6528251	64.015139	55.5587639
4644	(2007 KG7)	54251	1.779598	0.866934148	4.7391726	318.2953643	66.282232	333.020221
4645	(2007 LA)	54260	1.5499026	0.593201945	33.4994043	107.6841637	245.5835102	330.1677939
4646	(2007 LD)	55200	1.72649774	0.439163955	16.4726877	316.6810965	226.3582368	71.3543998
4647	(2007 LE)	55200	1.83863094	0.516611999	29.4838256	119.9105627	73.9005994	29.6206845
4648	(2007 LF)	55200	1.68290592	0.419788506	6.9803467	333.6358508	239.5372832	81.0083531
4649	(2007 LL)	55200	0.98107453	0.1740164	10.0506641	211.294592	247.1819468	16.0169526
4650	(2007 LS)	55200	2.69450549	0.682381659	6.3749361	168.6241372	200.9799048	168.0945303
4651	(2007 LT)	55200	1.49672488	0.379161731	0.6829785	342.6826636	222.2858196	171.0572699
4652	(2007 LU)	55200	2.17685684	0.531345542	1.3860184	196.9922696	42.4782009	293.5994574
4653	(2007 LV)	55200	1.76270286	0.270949403	16.9983126	261.9655548	70.3688647	0.5842919
4654	(2007 LV8)	55200	1.80809576	0.373480283	14.9829384	35.6699199	245.5930501	9.739807
4655	(2007 LA15)	55200	1.72690527	0.381179207	8.7173624	176.9262143	152.6714523	12.3683109
4656	(2007 LB15)	55200	0.9382905	0.395262854	25.1947796	237.3194695	262.8409575	33.2438087
4657	(2007 LC15)	54266	1.31767104	0.739546742	28.3626117	341.1391376	107.0939454	26.1568261
4658	(2007 LQ19)	55200	2.60984246	0.62768981	17.0500849	207.6249193	110.9314773	214.4697395
4659	(2007 LT19)	55200	1.4700521	0.298419393	6.7103798	15.3149503	262.3209499	148.9275974
4660	(2007 LU19)	54269	2.37360764	0.625610482	2.609856	142.6321656	64.0147853	11.3017099
4661	(2007 LV19)	55200	1.47178959	0.320710721	14.8845089	301.2223837	264.1361287	181.0320077
4662	(2007 LW19)	54268	2.35765062	0.582120899	2.1669806	232.3570955	64.4418385	352.4619598
4663	(2007 LR32)	55200	2.62620193	0.516187155	10.1769939	71.9448302	266.7430351	198.6309595
4664	(2007 MF)	55200	0.98401096	0.050087966	17.4593571	346.6206243	85.6627688	54.7221929
4665	(2007 MG)	55200	1.27512688	0.467751849	24.8746556	248.1755998	258.402926	337.945477
4666	(2007 MH)	55200	1.52599793	0.328884756	20.3084384	303.2956585	274.1425382	152.7248354
4667	(2007 MQ)	54270	2.42590166	0.73658553	1.6712686	238.6580557	112.5414157	347.5066595
4668	(2007 MR)	55200	1.02265284	0.258751104	5.8165757	217.4779207	172.9320047	67.2488914
4669	(2007 MB4)	55200	2.23146132	0.579234821	1.1692125	97.5206752	223.8273394	261.3271103
4670	(2007 MC4)	55200	0.97219821	0.173732925	19.1874523	358.2515683	109.4122986	23.565203
4671	(2007 MK6)	55200	1.08079935	0.818775002	25.1414444	25.4232164	92.9242206	133.8764728
4672	(2007 ML6)	55200	2.23261029	0.466513397	11.4286729	220.6033328	109.9822443	257.6698423
4673	(2007 MJ13)	54273	1.44772074	0.382958599	10.8459561	58.3051072	268.0153645	334.2588065

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4674	(2007 MK13)	55200	1.02439998	0.139734884	19.8846709	259.852106	95.1325328	93.6677037
4675	(2007 ML13)	55200	1.29750159	0.084915327	18.0140853	139.1513584	135.5690474	250.2316205
4676	(2007 MM13)	55200	1.40110856	0.568826502	38.1827036	294.4058531	242.6832346	221.6785255
4677	(2007 MT20)	55200	1.84535974	0.613104911	16.6057472	148.4256073	226.5139074	334.3619757
4678	(2007 MB24)	55200	1.87611454	0.699985104	47.7088826	269.0944994	271.3038389	17.4449886
4679	(2007 MC24)	55200	2.28746522	0.495004713	21.3592183	244.6823796	103.5383999	240.427073
4680	(2007 ML24)	55200	0.75828004	0.358945296	33.431717	201.4800913	281.890036	152.4005262
4681	(2007 NQ)	55200	2.21207703	0.467363453	17.4778534	348.7107745	278.5933686	276.0312248
4682	(2007 NL1)	55200	1.23957926	0.249180937	18.6338658	266.8800368	117.1040529	227.9901953
4683	(2007 NS4)	55200	1.87439734	0.597595852	5.8050546	47.1709057	11.2772759	299.9319657
4684	(2007 NT4)	54298	1.65365447	0.346352248	9.2908013	169.8443792	102.1673237	11.2699039
4685	(2007 NC5)	55200	2.4458035	0.886822802	19.3419535	20.4553222	165.8665448	244.6901907
4686	(2007 OV)	55200	2.47883046	0.483796415	12.6771664	333.22925	353.6962504	221.2809653
4687	(2007 OX)	55200	1.50543628	0.348505277	22.0989378	110.4378906	122.0041242	155.8146022
4688	(2007 OY)	55200	2.19937664	0.500823372	8.001657	229.7273925	81.1658401	268.3311276
4689	(2007 OG3)	55200	2.16502552	0.480322733	1.6937717	271.8147537	78.4345637	274.7821442
4690	(2007 OH3)	55200	1.94732925	0.460873295	8.3056877	3.7100229	296.4340397	324.888639
4691	(2007 OR9)	55200	1.625596	0.262950619	11.8100848	125.5191285	138.4290141	88.8683951
4692	(2007 PQ)	55200	2.14462983	0.459536607	8.3896302	324.0566068	341.15328	277.6556532
4693	(2007 PF2)	55200	1.52784172	0.601724168	11.1359175	93.9540369	316.884532	70.3838941
4694	(2007 PF6)	55200	1.29856247	0.416432081	25.6080605	251.1653275	316.4481498	282.8852893
4695	(2007 PP6)	55200	2.1700494	0.832947811	18.5394662	12.8541823	77.2376601	241.5523199
4696	(2007 PB8)	55200	0.88051987	0.44511451	16.5605963	169.368775	323.2062118	173.435176
4697	(2007 PD8)	55200	2.11244358	0.484157192	4.0513009	260.9593761	66.7193881	278.9643557
4698	(2007 PE8)	55200	2.16517294	0.496754526	5.5815027	337.9393263	319.2396882	276.7228167
4699	(2007 PP9)	55200	2.34666177	0.544750421	5.17714	31.1270608	326.0353038	230.7479077
4700	(2007 PQ9)	55200	1.42659437	0.241108252	8.5565818	215.3369799	136.0321327	128.3632187
4701	(2007 PR9)	55200	2.44833731	0.520220063	5.2807339	283.0932968	81.2677936	211.9591939
4702	(2007 PS9)	55200	1.07410475	0.076231701	8.7025152	79.9584056	313.284942	351.8341778
4703	(2007 PR10)	54327	1.23313154	0.892636809	20.9970696	190.6498757	335.1769286	39.7973866
4704	(2007 PU11)	55200	2.82273001	0.552970018	13.8167384	195.0147761	207.9485272	164.5280958
4705	(2007 PH25)	55200	2.53815066	0.8139916	53.3011487	331.8601069	150.3152761	190.2925841
4706	(2007 PR25)	54328	1.94540065	0.845994218	3.4828791	291.3040475	154.9824478	342.5139292
4707	(2007 PS25)	55200	0.72870988	0.421503645	6.7188617	7.7724545	141.7443925	106.296117
4708	(2007 PV27)	55200	1.27343645	0.370915039	24.5997721	107.6158417	324.5075073	169.6473292
4709	(2007 PF28)	55200	2.14685296	0.801626857	5.8890291	261.1523113	180.2413239	255.0385619
4710	(2007 QA2)	55200	2.15699657	0.435387969	4.3712804	22.9291483	298.7268973	271.0724567
4711	(2007 QK2)	55200	2.12830388	0.450178952	3.6212987	167.7201868	185.8919858	264.8669914
4712	(2007 QE3)	55200	2.43623811	0.659661907	15.8073858	75.1066177	343.5469237	207.4437417
4713	(2007 QX14)	55200	2.35276362	0.457662656	5.2348571	250.0873645	20.8066421	262.2334487
4714	(2007 RD1)	55200	2.32572226	0.502472397	5.5922778	67.1369409	288.696494	233.03873
4715	(2007 RE1)	55200	2.63669191	0.618111182	5.4530316	165.5902152	235.6719557	183.9537187
4716	(2007 RF1)	55200	0.83679922	0.236319124	2.5891454	350.7403039	159.8887283	213.9469294
4717	(2007 RG1)	55200	1.65004736	0.362455892	3.1794501	24.2789826	323.2554637	33.7777823
4718	(2007 RH1)	55200	1.41490769	0.197762087	6.9865756	170.9093766	158.0170701	147.7610207
4719	(2007 RJ1)	55200	1.44906527	0.385418075	8.1749253	235.3498837	172.7716842	90.5544781
4720	(2007 RO1)	55200	2.26316171	0.605330979	8.5137909	306.9029887	339.5955582	258.5121635
4721	(2007 RS1)	55200	1.24369371	0.390784507	8.1559057	263.316946	162.1006859	203.9206842
4722	(2007 RT1)	55200	1.81569685	0.754091654	28.0848162	242.7287734	341.4944556	11.2384979
4723	(2007 RE2)	54351	2.29008308	0.535686664	12.284635	188.4549265	160.6224167	359.4173348
4724	(2007 RF2)	55200	1.72905395	0.663844068	6.0636461	83.1880627	12.3118938	339.6734707
4725	(2007 RG2)	54354	2.2018219	0.531331203	0.7345735	253.5479889	112.6833634	355.9227016
4726	(2007 RF5)	55200	1.06399653	0.383252886	31.926029	221.4221298	12.7179737	124.3023214
4727	(2007 RN7)	55200	1.29759863	0.112186345	9.8386459	232.4237329	152.6591297	174.6980258
4728	(2007 RX8)	55200	1.13848407	0.211269961	9.398375	281.9461384	348.4961673	23.2794886
4729	(2007 RY8)	54355	1.33286089	0.488204996	5.8699693	258.3372003	352.6367149	42.1728111
4730	(2007 RZ8)	55200	1.35247235	0.186222515	10.2713258	7.0345942	343.8178467	169.6370988
4731	(2007 RA9)	55200	2.67800577	0.541280832	14.4374754	256.111893	119.5637231	184.8622624
4732	(2007 RP9)	54356	1.53824514	0.3844507	26.3819733	61.8477406	342.3388568	335.6797945
4733	(2007 RS9)	54355	1.74602192	0.396962079	10.5409289	147.1601817	167.1803215	13.8296103
4734	(2007 RT9)	55200	1.6662247	0.58575199	21.32103	24.5743427	164.0300741	140.6640617
4735	(2007 RU9)	55200	1.91987329	0.629520929	5.6501853	285.8250448	164.456628	283.7003891
4736	(2007 RV9)	55200	1.9402379	0.566391624	6.3918989	116.3517361	340.7553614	264.8421195
4737	(2007 RY9)	54356	1.26885312	0.152129257	28.4866146	192.932643	169.3169231	350.3910211
4738	(2007 RU10)	55200	2.2755056	0.687673843	15.2248977	132.7859242	325.2188526	212.824861

#	Object	Epoch	a	e	i	w	Node	M
4739	(2007 RP12)	55200	2.2750902	0.497986342	0.3298744	340.5985475	16.8217105	240.0731245
4740	(2007 RQ12)	55200	1.79236378	0.473281203	1.2396399	222.2778398	84.5019446	0.4987867
4741	(2007 RR12)	55200	2.00959341	0.728697726	7.0802671	132.1643319	336.096446	269.0166732
4742	(2007 RS12)	55200	2.1371601	0.452029537	6.9426515	170.5987998	172.4867565	269.9406224
4743	(2007 RT12)	55200	1.01686859	0.159916354	4.2500756	43.2791087	167.6228076	221.5373073
4744	(2007 RU12)	55200	2.29078522	0.448889929	7.0094994	334.5915872	56.3737673	228.8342287
4745	(2007 RV12)	55200	1.66768633	0.389480509	4.0133782	190.0356431	163.3670898	25.20044
4746	(2007 RP15)	54358	0.94623078	0.499759004	15.147786	47.3082281	171.9467695	77.2741557
4747	(2007 RO17)	55200	0.92661702	0.19691474	2.4649544	195.3488015	355.190573	1.461822
4748	(2007 RP17)	54360	2.08832675	0.485274356	4.2409309	332.8276923	349.4900809	8.9854535
4749	(2007 RQ17)	55200	1.58270868	0.370847242	1.9788118	299.6224127	353.1971086	83.5077059
4750	(2007 RR17)	55200	2.17103137	0.527973612	1.7290902	348.0169555	354.8573397	261.9473282
4751	(2007 RS17)	55200	1.47190231	0.260200351	34.2393578	315.7834319	354.6556194	131.3757065
4752	(2007 RT17)	54357	2.05110184	0.53157212	7.1847963	311.0845199	354.7774266	13.1662243
4753	(2007 RU17)	55200	2.04246329	0.827924344	9.051969	129.6148905	17.6461383	244.2216756
4754	(2007 RV17)	55200	2.11140738	0.684407069	11.0953807	321.667552	146.9003231	244.6482896
4755	(2007 RW17)	55200	2.2877068	0.493158745	3.2674681	246.734159	99.4415993	240.2105841
4756	(2007 RT19)	55200	1.86225511	0.376747576	24.3855924	96.4806833	198.0629779	7.536297
4757	(2007 RU19)	54358	1.71682911	0.405958736	2.834556	340.4615533	353.1964725	7.433684
4758	(2007 RV19)	55200	3.25590432	0.635816655	15.449792	161.2275521	164.9544054	144.0162431
4759	(2007 RW19)	55200	1.70657574	0.460471292	9.5604362	52.7438178	351.7737621	353.4446313
4760	(2007 RX19)	55200	1.95603673	0.533141728	40.4496895	97.0332777	349.582934	261.1836354
4761	(2007 RY19)	54361	1.10696279	0.252243965	12.5679047	98.9128449	352.5282781	295.6667066
4762	(2007 RZ19)	55200	2.25663142	0.470228058	3.7707233	161.796432	182.4509879	249.3630081
4763	(2007 RA20)	55200	2.16265069	0.631910217	10.7316319	320.2049332	124.144302	239.7220207
4764	(2007 RC20)	54358	0.95480628	0.19842841	2.8413776	309.2792849	165.0551341	258.080947
4765	(2007 RD20)	55200	2.41262332	0.548561832	11.0417369	341.2628403	26.6177607	218.338304
4766	(2007 RL133)	55200	2.45560691	0.552109265	12.5482651	272.1214225	28.2196454	231.5546378
4767	(2007 RM133)	55200	2.21064768	0.440050642	10.7459891	181.0018024	106.2005429	287.9200525
4768	(2007 RN133)	54359	2.23336452	0.663149081	18.6254516	75.2398244	351.664697	345.6130518
4769	(2007 RO133)	54359	1.93279946	0.470878573	12.8160486	185.6072371	172.1585486	358.7660894
4770	(2007 RP133)	55200	2.61336172	0.539672299	8.7188713	31.1041121	338.8877646	193.3808422
4771	(2007 RQ133)	55200	2.76588316	0.656007093	15.5314218	271.1147045	17.3781169	200.4672759
4772	(2007 RS146)	54366	2.3680002	0.641282529	2.6547475	158.1478842	132.3254312	14.4514764
4773	(2007 RT146)	55200	1.83631388	0.448648162	16.8201485	86.1226195	196.2169664	19.5911453
4774	(2007 RT147)	55200	2.28734333	0.470197467	3.8360145	344.950381	99.2105726	202.5770612
4775	(2007 SH)	54361	1.72772524	0.472520714	11.6737942	311.1305993	353.002976	17.3223289
4776	(2007 SJ)	55200	2.01499168	0.534878947	8.2024655	174.9155445	306.9509142	210.439431
4777	(2007 SR1)	55200	1.04956644	0.499235592	19.7083244	177.4892002	9.2862726	224.8959163
4778	(2007 SS1)	55200	2.20404532	0.531025026	3.3540499	327.1892209	33.4609242	250.9325198
4779	(2007 SU1)	55200	2.40594865	0.590707219	2.476234	30.1631834	355.0371051	214.6302993
4780	(2007 SV1)	55200	0.75647493	0.378482477	4.1068094	189.7591448	348.1163022	351.6943117
4781	(2007 SV2)	55200	1.88432964	0.467005808	7.4371002	110.1544615	323.3629273	285.749534
4782	(2007 SW2)	55200	0.91185921	0.465647659	8.5663625	173.8926123	339.7378315	113.1855701
4783	(2007 SN6)	54365	2.34234767	0.688278379	4.7466399	286.0930913	357.4171764	13.3037266
4784	(2007 SO6)	55200	1.31970353	0.228299426	13.2114533	157.6194147	178.338801	197.0664937
4785	(2007 SP6)	55200	2.56113285	0.546803653	13.9526177	330.4070734	68.7618774	194.6551875
4786	(2007 SQ6)	55200	1.04303312	0.145511911	9.1009693	283.7460212	191.4374689	308.2189792
4787	(2007 SE11)	55200	1.9581085	0.356497457	48.2739355	353.1433569	50.0953343	285.4287359
4788	(2007 SG11)	55200	0.8351429	0.248488254	6.8842447	345.6296918	193.7082462	179.2269258
4789	(2007 SR11)	55200	2.69632259	0.644210792	1.4600359	98.1744985	219.743359	194.7223535
4790	(2007 SV11)	55200	1.73421095	0.493796731	32.2368022	23.6569352	292.2940118	5.9162872
4791	(2007 TD)	55200	0.68923003	0.535813635	3.4914774	12.1258175	186.0046161	129.4152703
4792	(2007 TC1)	54378	1.26515806	0.238312552	23.8751006	115.1058375	189.375605	43.4721291
4793	(2007 TD1)	55200	2.38781695	0.561148411	2.0832369	0.4180553	7.649503	220.2430528
4794	(2007 TG1)	55200	2.06791538	0.487488795	3.6036198	219.0288525	187.1869473	260.7669224
4795	(2007 TH1)	55200	1.36174038	0.41781525	20.1062274	282.3186547	13.7756158	185.5977334
4796	(2007 TH3)	55200	0.968338	0.121046271	8.2318891	237.9774054	11.8811149	238.6577317
4797	(2007 TK5)	54382	1.61360622	0.658458488	3.377098	164.2548409	317.7675709	330.9323329
4798	(2007 TL5)	54381	0.86831288	0.595453586	12.9854362	219.0203026	12.1230132	81.1248569
4799	(2007 TG8)	55200	2.64592699	0.626592785	15.4064442	103.9508752	348.1810452	168.2397504
4800	(2007 TK8)	55200	1.49689147	0.159666854	3.0947159	171.7751326	217.1793873	71.3713033
4801	(2007 TB14)	55200	2.49341608	0.637490401	5.9793766	124.4611377	200.7216936	214.4217118
4802	(2007 TC14)	54386	2.090714	0.80745729	4.6396654	268.6784749	224.6676035	343.9128355
4803	(2007 TD14)	55200	2.36404155	0.466763351	4.7806112	127.3186662	185.9192383	250.4388357

#	Object	Epoch	a	e	i	w	Node	M
4804	(2007 TE15)	54382	1.80971369	0.487386412	13.2857881	129.760487	192.9778455	16.983291
4805	(2007 TF15)	54382	1.10764839	0.041611004	4.1848953	21.0088408	193.203088	159.2958086
4806	(2007 TG15)	55200	2.25333703	0.475358269	4.5949755	136.5334276	282.3215184	223.6621095
4807	(2007 TH15)	54383	1.8341324	0.390209206	30.6101424	41.8737362	16.7063351	342.3093368
4808	(2007 TJ15)	54382	2.05611824	0.476682929	2.2338846	322.5034993	26.3329642	8.6439415
4809	(2007 TK15)	55200	1.90872755	0.425002644	1.0427099	205.4425986	114.7188592	333.1619929
4810	(2007 TL15)	54383	1.39283997	0.547825188	1.3308384	240.7719223	29.7741807	42.3250731
4811	(2007 TM15)	55200	1.67262713	0.508209599	61.5252376	90.468959	22.8801255	337.2863874
4812	(2007 TL16)	55200	1.46037983	0.399923366	10.494756	303.8555578	12.9905959	122.4347819
4813	(2007 TT18)	54384	2.37848021	0.640498024	14.2362158	240.3324124	196.3324214	348.0815073
4814	(2007 TU18)	55200	2.52842102	0.600572154	3.4791284	204.9601635	198.2254841	194.5365596
4815	(2007 TV18)	54386	1.23656888	0.348347805	0.9580022	288.5135376	354.2011797	52.3986433
4816	(2007 TX18)	55200	2.13697242	0.416141196	7.3703545	15.7952988	284.2791631	308.9354596
4817	(2007 TY18)	55200	2.15422683	0.40946126	8.0498381	301.5590952	6.2313928	298.3075586
4818	(2007 TZ18)	55200	2.20175352	0.491597048	8.7944798	184.2174548	211.6315139	243.399525
4819	(2007 TA19)	55200	0.95397175	0.509398566	22.6338952	57.983232	181.2483562	224.9283594
4820	(2007 TH19)	55200	2.5142101	0.49754507	2.2762835	194.7075656	86.4080228	261.5131094
4821	(2007 TJ19)	55200	1.42546391	0.276198503	40.6074751	251.2856991	200.2767545	65.3853718
4822	(2007 TS19)	55200	1.08363548	0.50042263	15.6355162	117.960047	24.2465403	286.8415223
4823	(2007 TX22)	54384	1.59567767	0.436733864	1.7855129	46.0705559	20.3155522	341.1974755
4824	(2007 TA23)	55200	1.38275875	0.248425774	6.0531024	5.6837437	18.4548387	132.2034362
4825	(2007 TB23)	55200	1.26206851	0.197685826	38.2910737	173.752856	40.1377027	19.4663737
4826	(2007 TC23)	55200	2.79021434	0.619681092	13.2553608	12.9894556	56.0080638	164.5143832
4827	(2007 TL23)	55200	1.13441859	0.736332465	2.1202916	101.8617653	136.8425538	352.1733218
4828	(2007 TQ24)	55200	0.79340747	0.539527861	10.5987604	29.8994307	183.6065227	191.5854033
4829	(2007 TR24)	55200	1.8692071	0.667344526	3.5672978	36.9461733	87.1814116	285.5701626
4830	(2007 TS24)	54386	2.79591874	0.65196409	5.4026978	32.2369886	22.3614744	354.0402376
4831	(2007 TT24)	54385	1.44031689	0.280225081	0.8171903	19.6597797	6.0969486	355.4168594
4832	(2007 TU24)	55200	2.04344953	0.534574257	5.6228719	334.1932682	127.0778998	245.4491136
4833	(2007 TW24)	54386	2.13707389	0.591355763	2.3104292	59.1129616	14.1138416	347.2034706
4834	(2007 TX24)	55200	2.31375112	0.536018955	8.1641438	168.8212105	200.2759415	230.5736493
4835	(2007 TY24)	54389	2.50758382	0.579375999	4.293666	180.7506718	194.3120885	1.8619827
4836	(2007 TA25)	55200	2.32312399	0.55292654	6.9582442	277.9022255	6.3959361	260.3219984
4837	(2007 TB25)	54385	2.30480197	0.556840065	12.2412376	235.273465	183.7349273	351.0221124
4838	(2007 TG25)	55200	2.31432904	0.447548336	3.7415826	279.7545373	40.3531103	254.2994389
4839	(2007 TR65)	55200	1.15440476	0.560993593	43.5050345	215.692595	23.7929954	359.2612024
4840	(2007 TC66)	55200	2.07110674	0.710300139	10.6049268	34.6637544	102.7004019	240.6628504
4841	(2007 TD66)	55200	0.96644728	0.310337425	14.8809937	1.2681283	205.2141813	294.200408
4842	(2007 TE66)	55200	1.05571718	0.204459764	10.2454585	355.2120843	195.7752942	223.9696916
4843	(2007 TF68)	54387	1.40273063	0.26394649	26.1068983	62.5578499	19.3999831	322.4214156
4844	(2007 TR68)	55200	0.87536068	0.257656437	11.3572023	144.9661907	18.1802878	177.3321404
4845	(2007 TS68)	55200	2.24787554	0.436757609	5.5825787	137.1751053	167.0352907	278.3293473
4846	(2007 TU68)	54389	2.34201052	0.567107271	1.7512325	204.2880438	194.3614615	356.399598
4847	(2007 TV68)	55200	2.60885348	0.570198564	1.7846814	337.8790033	46.9133414	189.38707
4848	(2007 TW68)	55200	2.43424807	0.51358236	2.5239364	292.1723898	3.9655505	246.1394432
4849	(2007 TX68)	54387	2.03178524	0.53206188	4.3870024	38.7500528	21.637659	348.9743996
4850	(2007 TZ68)	54387	1.6461597	0.419919518	4.3985632	37.4153195	20.8677372	345.2419696
4851	(2007 TD71)	55200	1.28636319	0.279515611	49.7537846	220.7298111	49.6082052	259.5648967
4852	(2007 TE71)	55200	1.24399981	0.187535273	7.4498139	109.9582408	200.5534379	266.5157339
4853	(2007 TG71)	54388	1.30487232	0.23843243	10.4204368	44.3500856	18.4136761	333.7277609
4854	(2007 TH71)	55200	1.34111361	0.313056788	7.0645563	52.8736705	20.0380656	127.4865993
4855	(2007 TH72)	54393	2.03057582	0.640257349	2.1531706	288.261884	15.831939	18.4977678
4856	(2007 TN74)	55200	0.89624356	0.298219306	9.6805651	146.1426982	14.944478	111.2508452
4857	(2007 TO74)	55200	2.16194268	0.477476827	6.8456228	249.1895598	49.0710812	286.9234247
4858	(2007 UG)	54389	1.68787738	0.382195298	12.6042976	161.7866006	197.5287632	8.5016877
4859	(2007 UH)	55200	1.17260949	0.336115435	15.1319989	294.8067766	206.686054	192.2199538
4860	(2007 UJ)	55200	1.14476485	0.140350662	22.6927731	42.7436511	22.6456305	260.019465
4861	(2007 UR)	55200	2.80718656	0.614386505	3.2280208	23.4855497	30.5197095	163.1913553
4862	(2007 US)	54390	0.95751328	0.575323668	12.0785455	202.7611472	24.3335669	96.6150968
4863	(2007 UT)	55200	1.51745077	0.355779751	45.5875012	63.2613519	30.2733913	30.9301359
4864	(2007 UW1)	55200	0.90744385	0.121060879	8.223694	146.5716154	26.0230089	64.5253958
4865	(2007 UX1)	55200	2.44326167	0.483805941	9.8277405	321.5988564	74.4492724	207.985838
4866	(2007 UY1)	55200	0.95049068	0.174680921	1.0226863	273.3808676	337.922753	253.574912
4867	(2007 UA2)	55200	1.97508868	0.433395088	1.0066669	79.0606899	21.0532397	254.2082452
4868	(2007 UB2)	54392	1.45500688	0.276158936	8.979822	300.2702141	204.8966865	269.1333981

#	Object	Epoch	a	e	i	w	Node	M
4869	(2007 UC2)	55200	1.66490986	0.352351351	12.4719378	172.9863108	211.5865718	10.0124333
4870	(2007 UR3)	55200	1.55999674	0.283844296	1.3106335	316.1363604	156.1621765	354.6681667
4871	(2007 US3)	54396	1.51278957	0.363485847	24.3405395	286.9054219	28.846928	37.2429791
4872	(2007 UT3)	55200	0.77238637	0.399503888	0.5959646	25.1635918	156.5200808	322.5887968
4873	(2007 UU3)	54395	1.86777892	0.501755029	2.4500817	254.0700606	180.9310786	346.1264147
4874	(2007 UW3)	55200	2.57089886	0.509311882	23.1097659	175.7927811	219.7988603	193.5502918
4875	(2007 UB6)	55200	1.43864427	0.166441746	14.1998674	255.193368	56.9091445	165.9577994
4876	(2007 UC6)	54394	1.59074173	0.598537427	1.7564252	119.5357099	0.3434301	330.8300669
4877	(2007 UD6)	55200	1.23210343	0.242656099	1.6933885	131.1439144	205.9812187	251.944958
4878	(2007 UE6)	54394	1.5399297	0.568120264	6.2889389	286.1490679	197.8558248	328.6470055
4879	(2007 UF6)	54395	1.95708721	0.524722428	3.496803	231.3146983	200.6975471	347.4446366
4880	(2007 UG6)	55200	1.87104641	0.438497297	15.3158326	197.9134934	215.3705563	301.1272745
4881	(2007 UO6)	54395	2.29542156	0.603326936	2.4056229	320.1053084	23.6327644	9.6195185
4882	(2007 UP6)	55200	0.96786416	0.094299395	9.578352	236.2238779	31.4447196	225.976153
4883	(2007 US6)	55200	2.22132288	0.447436394	12.4234752	224.909904	225.7390225	217.013866
4884	(2007 UL12)	55200	1.96814828	0.806006901	4.1831143	95.4967213	67.2549494	264.1402729
4885	(2007 UM12)	55200	1.73332239	0.391139987	9.9768887	152.3554939	208.56287	355.6254084
4886	(2007 UN12)	55200	1.05381971	0.060450627	0.2348701	134.2573647	216.1782039	47.159751
4887	(2007 US12)	55200	0.90609041	0.51460242	8.805911	44.5512311	211.18405	278.9492001
4888	(2007 UQ13)	55200	1.1649112	0.425100673	29.305246	29.3799414	217.7163037	22.6808276
4889	(2007 UK40)	55200	1.4379231	0.401622811	18.8453531	293.6590996	38.8892299	123.4816775
4890	(2007 UQ51)	55200	2.14302747	0.512150837	3.4375745	142.7632931	206.4094999	259.869165
4891	(2007 UR51)	55200	1.64417498	0.690625483	7.2603758	72.753881	208.5563374	39.8361686
4892	(2007 US51)	54406	2.19474221	0.632821568	1.4730911	297.9004909	39.3793068	12.7429365
4893	(2007 US65)	54408	2.64344791	0.520579121	1.0207565	123.5491072	192.5336488	31.2313695
4894	(2007 UT65)	55200	2.05725292	0.479869286	9.8697881	35.7642944	37.5773162	254.7187587
4895	(2007 UB66)	54407	2.08781224	0.622093827	30.0637408	148.8879895	279.4069066	8.648512
4896	(2007 VG)	55200	1.9569168	0.664828929	51.1624048	261.5997948	33.4913306	310.0154034
4897	(2007 VZ2)	54407	0.98643309	0.186997191	30.9259026	70.748367	217.7914099	89.7906058
4898	(2007 VA3)	54408	2.46034041	0.611756302	2.9070891	216.3394224	222.2184157	352.2932504
4899	(2007 VB3)	55200	1.64878714	0.336241861	1.686432	18.2048418	38.4841457	1.3729944
4900	(2007 VC3)	54408	1.13037385	0.319098712	12.6909215	90.9750941	214.0662863	59.1459782
4901	(2007 VD3)	55200	0.97217284	0.15030987	13.1191871	179.8409322	53.8101816	258.1031879
4902	(2007 VE3)	54409	2.29633118	0.702638238	1.4066418	325.8243893	343.5357067	17.7462184
4903	(2007 VF3)	54407	2.31562708	0.511994125	7.8245059	191.7068718	214.9435678	358.2623029
4904	(2007 VG3)	55200	3.29314333	0.694378635	10.9612628	174.8692916	215.3810343	132.0373003
4905	(2007 VH3)	55200	1.97212587	0.432042124	2.918738	345.1592579	120.3163929	258.4069923
4906	(2007 VI3)	54408	2.12814157	0.614812592	12.6516347	299.3922363	37.4984286	14.568552
4907	(2007 VK3)	55200	1.12456909	0.10597223	24.8270645	109.5167095	38.369468	202.5673549
4908	(2007 VL3)	54409	1.45255119	0.451831731	2.3313047	101.3420628	225.3816757	30.6975858
4909	(2007 VN3)	55200	2.24232595	0.578425448	15.5480883	319.7172489	22.2199288	245.113779
4910	(2007 VQ4)	55200	2.63693759	0.517142869	26.5053147	99.5801627	59.3249737	154.2260276
4911	(2007 VS6)	54408	1.23539566	0.445939197	7.9545031	83.3197694	220.3658047	45.6545109
4912	(2007 VT6)	55200	1.95001383	0.643844039	7.3819061	293.9914915	213.5222177	256.4060037
4913	(2007 VU6)	55200	0.97638789	0.090554345	1.2230965	34.5261598	220.3653517	230.295508
4914	(2007 VV6)	55200	1.41526766	0.279917412	3.8039172	149.8058703	235.7946506	111.769092
4915	(2007 VW6)	55200	1.66586664	0.337851136	39.0843273	124.3555036	225.291258	34.1769752
4916	(2007 VX6)	55200	2.26696153	0.61440611	41.1313139	119.8491635	233.7940095	241.6276908
4917	(2007 VV7)	54409	1.777770115	0.43865873	0.7826581	97.5076014	274.2925285	11.0183005
4918	(2007 VW7)	55200	1.3299254	0.227753906	12.4737727	209.7745182	220.8252886	130.3774126
4919	(2007 VX7)	55200	1.87597534	0.376006258	16.8090552	105.2990043	244.007939	325.4151923
4920	(2007 VY7)	55200	1.81567375	0.503525898	6.3606983	9.5052933	108.0988545	290.3646327
4921	(2007 VD8)	54409	2.29894357	0.594252972	3.1562139	318.5735761	43.5994885	8.7297226
4922	(2007 VE8)	54412	2.50793953	0.5860184	7.2167042	351.7051014	44.0202673	2.2050951
4923	(2007 VF8)	54411	1.78534036	0.456200917	30.5291771	36.7620969	41.9373533	346.9767874
4924	(2007 VH8)	55200	2.70851507	0.589364692	26.0051704	44.0440769	41.1226687	164.6983281
4925	(2007 VI8)	54418	2.82999114	0.604773933	0.3568079	176.650778	236.2163286	359.8318174
4926	(2007 VK8)	54411	1.40897933	0.541502922	3.3512911	0.0165893	148.0546657	319.1421477
4927	(2007 VL8)	55200	0.93616742	0.359430411	9.3380882	194.5773133	62.455525	258.7996313
4928	(2007 VD12)	55200	1.14605925	0.364825457	22.85533	91.2876715	62.7526633	209.4192473
4929	(2007 VR29)	54413	1.81584667	0.453627949	12.2768225	214.6480767	222.1366613	348.9844032
4930	(2007 VT83)	54411	1.30143885	0.294972934	6.9032073	289.6937741	38.3623984	42.4756707
4931	(2007 VU83)	55200	2.34999975	0.583517921	0.598619	270.0778181	106.2002295	221.7897107
4932	(2007 VV83)	55200	0.96646733	0.097861419	10.1198015	318.6591836	225.5915736	325.4375779
4933	(2007 VW83)	55200	0.90086259	0.218820212	7.1357734	163.4426368	39.266903	40.5570285

#	Object	Epoch	a	e	i	w	Node	M
4934	(2007 VX83)	54412	1.2207735	0.449826834	5.6533774	275.1963803	224.7448439	315.9974637
4935	(2007 VM84)	54413	1.29828315	0.189948956	24.6345475	7.615717	44.6597471	356.7316019
4936	(2007 VO84)	54413	1.3087295	0.186468434	28.3029224	302.350307	47.616071	40.1726172
4937	(2007 VA85)	55200	4.22755013	0.736321482	131.7666148	26.0405199	115.4832626	101.0674882
4938	(2007 VW137)	55200	2.22971524	0.738192531	5.9530621	244.6709946	300.0017477	192.6288596
4939	(2007 VX137)	55200	2.20705078	0.427545723	6.1582532	327.2299207	7.6483961	274.6159335
4940	(2007 VY137)	54414	0.89744261	0.3830457	16.49779	42.6711368	223.2667827	100.6003737
4941	(2007 VZ137)	54415	1.68873322	0.579543695	5.1602463	63.5617874	226.5981325	45.9621729
4942	(2007 VA138)	54414	1.42380587	0.154389664	19.2367862	319.4667761	225.6317966	232.2681661
4943	(2007 VB138)	55200	0.77247486	0.431024406	6.0256	161.443657	42.1973768	292.7333133
4944	(2007 VC138)	55200	2.11556987	0.497211257	28.7185212	167.3109964	232.1769088	261.3175767
4945	(2007 VD138)	55200	2.79163085	0.642966613	1.6661971	333.817531	83.5931473	164.2208321
4946	(2007 VE138)	55200	1.35736859	0.418332766	19.3414793	73.5426784	50.3283268	95.2998834
4947	(2007 VR183)	55200	2.68518924	0.622804087	23.2985898	297.6075038	221.1723397	147.5677248
4948	(2007 VD184)	55200	1.94346149	0.503253204	1.2306434	204.3065167	239.4730266	273.3952274
4949	(2007 VE184)	54416	2.05272654	0.490288144	2.9490097	161.3798665	231.5016187	4.6526096
4950	(2007 VF184)	54416	1.21133018	0.242210964	18.8635555	241.0390683	227.031975	322.3097141
4951	(2007 VG184)	55200	2.38841771	0.669800658	16.0639597	155.8112408	147.0368327	223.699593
4952	(2007 VH184)	55200	2.55942082	0.599715481	3.8817072	246.9151498	139.3663158	192.6892339
4953	(2007 VJ184)	55200	1.68599113	0.460837248	18.1696307	62.3272667	41.4854025	330.5119061
4954	(2007 VK184)	55200	1.72624446	0.570018077	1.2225222	73.1214315	254.0204209	3.3508265
4955	(2007 VL184)	55200	1.29426417	0.20726901	27.6511802	348.1048247	48.2645835	172.6855127
4956	(2007 VM184)	55200	1.18168618	0.523177771	23.2653714	110.1122205	65.8256454	176.7189859
4957	(2007 VH186)	55200	1.57416773	0.196774893	19.2376572	15.102151	51.514925	12.445796
4958	(2007 VA188)	55200	2.9731304	0.631924415	20.2591039	333.1294323	38.5219551	154.3559485
4959	(2007 VB188)	55200	0.88210306	0.224834031	7.2242209	155.061325	43.1851059	78.7417814
4960	(2007 VF189)	55200	1.20748714	0.385383611	6.9797732	83.4768928	51.8541969	178.2675145
4961	(2007 VG189)	55200	2.14859639	0.513158861	6.0328417	70.7396143	250.5849232	287.3509935
4962	(2007 VH189)	54420	2.60865268	0.722137655	5.8727965	250.1347201	75.5185317	14.3540556
4963	(2007 VJ189)	54419	1.12252295	0.149508461	18.2015877	278.4259862	54.7722133	62.5499246
4964	(2007 VB191)	54423	2.37897464	0.614787945	2.9348478	46.264718	54.4694232	350.976959
4965	(2007 VC191)	54420	1.59957121	0.316731019	21.7413055	226.0341784	64.6445927	83.3748053
4966	(2007 VD191)	54419	1.1123216	0.245542826	12.6648352	95.6774365	223.370938	66.9767614
4967	(2007 VE191)	55200	1.91390164	0.628396582	5.3912323	253.9792812	244.4089984	268.6937509
4968	(2007 VF191)	55200	1.91242926	0.410862205	11.0090844	318.5793725	67.2134662	302.4834378
4969	(2007 VL243)	55200	0.9651947	0.72857621	43.3328671	91.2171268	114.7942516	6.369129
4970	(2007 VM243)	55200	1.07234979	0.337722862	12.2506165	210.213547	353.6196236	197.1948432
4971	(2007 VN243)	55200	2.15176286	0.612477291	4.4199548	52.5934669	90.590822	218.634191
4972	(2007 VO243)	55200	1.84333476	0.401078673	9.6290792	230.469387	96.0070679	353.3046972
4973	(2007 VP243)	55200	2.25547375	0.584377171	5.6405696	311.865745	14.0814385	252.2069085
4974	(2007 WA)	55200	1.0350013	0.152837558	6.163908	276.5841455	229.4501932	294.731317
4975	(2007 WB)	55200	1.66932522	0.709589912	13.7559862	203.6553967	83.1495158	49.022922
4976	(2007 WC)	54421	2.26545897	0.546812751	0.6523086	307.4062503	104.7375453	0.687385
4977	(2007 WE)	54421	4.03262587	0.731525945	25.4612366	287.9864118	40.7646233	13.0525469
4978	(2007 WJ3)	55200	1.19221708	0.371504116	6.2511049	91.5323778	235.300991	276.0539681
4979	(2007 WK3)	55200	1.6458552	0.388860791	9.9755171	202.7822382	233.6569572	354.2604744
4980	(2007 WL3)	54422	1.75832288	0.611781595	29.7344863	273.4385905	53.6282461	23.544212
4981	(2007 WM3)	55200	0.79411508	0.42801003	6.4689233	204.0710672	55.5000454	126.061738
4982	(2007 WN3)	54425	2.53305701	0.626701737	8.5918759	289.8834234	54.6033713	14.1504488
4983	(2007 WP3)	55200	1.48585433	0.446876461	10.6698026	115.5684967	229.2489363	91.4905621
4984	(2007 WQ3)	55200	1.37066021	0.179977854	17.2207817	248.6398387	216.6017551	81.0830085
4985	(2007 WT3)	54425	2.35500429	0.721624421	5.1681918	102.637054	227.1913662	14.6570734
4986	(2007 WU3)	54423	1.01159905	0.205109717	2.3758596	351.2428196	178.7008233	266.6897669
4987	(2007 WV3)	55200	1.66796628	0.452573638	12.6580854	107.6213539	261.4672767	23.5917667
4988	(2007 WW3)	54423	2.40002505	0.536525082	6.0555382	356.5697818	50.6469386	2.8244113
4989	(2007 WY3)	55200	2.79331783	0.768357536	11.9239585	50.6398731	286.3834375	184.0849559
4990	(2007 WT4)	55200	2.23759922	0.42252691	7.028421	201.5292169	228.7454728	223.9631744
4991	(2007 WU4)	55200	2.55364282	0.507883403	29.2117487	283.3197817	67.053348	213.0930221
4992	(2007 WV4)	55200	1.48552428	0.440891898	38.3308576	297.5893944	249.9589721	352.1586077
4993	(2007 WW4)	55200	2.0962907	0.716614446	10.4471388	135.0241185	185.2719559	269.7857758
4994	(2007 WX4)	54427	1.77530387	0.301812402	28.1738513	95.1381067	254.4855499	30.1553679
4995	(2007 WZ4)	55200	1.36265658	0.281650747	2.9447936	316.2051565	62.8403747	141.9130942
4996	(2007 WB5)	55200	1.76827381	0.677376328	18.9643218	153.2778618	38.805272	269.5735967
4997	(2007 WC5)	55200	0.9731892	0.210427704	8.5354716	66.2115035	236.7972265	167.600023
4998	(2007 WD5)	55200	2.46146499	0.597826297	2.425167	309.7208302	68.4149582	206.5632794

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4999	(2007 WE55)	55200	1.90950864	0.57394852	11.5063099	205.8066518	304.0049069	262.1062244
5000	(2007 WF55)	55200	2.4005077	0.527535001	19.6777911	111.5819645	280.9339057	212.9440047
5001	(2007 XN)	55200	2.21797044	0.567669906	24.7434572	215.296927	256.6769305	219.6107641
5002	(2007 XO)	54438	1.44229651	0.681094711	13.3591144	112.7087483	69.798911	330.0634508
5003	(2007 XP)	54439	0.98670894	0.271391964	7.6668278	64.7308875	255.6780956	83.3836198
5004	(2007 XN3)	55200	2.61324652	0.592098945	6.558685	109.271405	270.4345884	186.5715417
5005	(2007 XO3)	55200	2.4390886	0.542441971	13.1725921	200.2982411	244.0174309	194.0224388
5006	(2007 XP3)	55200	2.24344767	0.887771797	13.2325053	213.9606655	95.0193863	241.1491723
5007	(2007 XQ3)	55200	1.98557933	0.422260326	6.5943643	233.489867	253.9581073	250.0689879
5008	(2007 XT3)	55200	2.26660016	0.580773809	20.7422998	54.3673064	77.1404662	204.315241
5009	(2007 XY9)	55200	2.04840478	0.619797944	3.3357491	126.961248	234.3563119	270.232142
5010	(2007 XZ9)	55200	2.03897092	0.586388282	3.0345675	125.9107619	247.9392579	271.4856716
5011	(2007 XA10)	54441	1.60967245	0.355419614	19.9151724	314.9081567	75.5428427	21.68933
5012	(2007 XB10)	55200	2.20871823	0.599612345	41.3583082	37.2439469	261.2157713	303.4312902
5013	(2007 XC10)	55200	1.61930034	0.226190634	47.9310405	112.5245505	254.0693348	50.2822106
5014	(2007 XD10)	55200	2.15611654	0.665687233	18.5727172	79.7418726	270.5658429	258.7244012
5015	(2007 XK11)	55200	2.77289529	0.620827855	3.4355888	197.119744	167.4867899	173.7520432
5016	(2007 XH16)	55200	1.1870088	0.23476533	27.4290568	58.2658033	91.3305674	167.6190401
5017	(2007 XJ16)	55200	2.25598612	0.556749064	6.2966078	32.1293671	309.5539777	264.0430521
5018	(2007 XN16)	55200	2.46524379	0.60288909	4.1878146	162.0882243	258.0996873	195.8808871
5019	(2007 XF18)	54450	1.48053081	0.481379391	59.5194904	267.9677517	76.1730132	41.1892108
5020	(2007 XJ20)	55200	1.69314995	0.599554851	10.6247074	151.6946395	56.7303533	275.0100376
5021	(2007 XA23)	55200	1.60553009	0.376903016	8.3262579	62.5742305	78.9543341	336.6343016
5022	(2007 XB23)	55200	1.04127405	0.054263691	8.5299063	192.9926761	260.3050057	327.1386176
5023	(2007 XT23)	54451	2.80263234	0.616262686	17.1640111	332.2602089	78.9827314	5.8426585
5024	(2007 XV23)	55200	2.85350966	0.649725176	5.3821043	346.8057041	81.056655	156.0000229
5025	(2007 XW23)	54450	1.45017511	0.385847611	7.8190401	299.2396817	81.5870534	28.1996439
5026	(2007 XF25)	55200	1.18294745	0.132226834	24.4870007	302.5978878	272.8155908	101.6441899
5027	(2007 XA51)	54450	1.38128369	0.164885862	31.4554597	358.9970073	78.0525814	1.6219707
5028	(2007 YF)	55200	0.95293887	0.119931238	1.6529431	34.9141857	277.3803471	191.4831939
5029	(2007 YG)	54456	1.27072975	0.411545608	11.5230402	71.0924194	265.7433633	62.1617147
5030	(2007 YH)	55200	2.15297109	0.618386385	29.4593408	96.9330803	273.5527606	252.0596337
5031	(2007 YJ)	55200	1.10339206	0.27970578	3.308708	198.9289196	29.1844927	148.9955112
5032	(2007 YK)	55200	1.87048589	0.321631816	31.8353034	281.3546606	132.9282261	320.9911286
5033	(2007 YM)	54451	2.58536108	0.617341722	0.9904348	11.2976647	59.6281252	2.6166272
5034	(2007 YZ)	55200	1.04244678	0.361052895	16.4192461	129.5714629	90.7268508	239.9820227
5035	(2007 YF1)	55200	2.58395432	0.548452692	15.3808436	265.3355286	126.0211121	197.3558944
5036	(2007 YH1)	54452	2.08038001	0.566611336	3.1916415	72.9001358	72.0409302	345.3202032
5037	(2007 YJ1)	55200	1.26410325	0.177894847	4.0085256	333.5482588	97.4135024	170.9680914
5038	(2007 YM1)	55200	2.45904531	0.535634834	32.4865219	183.4941512	266.5861508	188.9734983
5039	(2007 YN1)	54455	2.68875949	0.718064823	3.9055413	294.4636263	84.7835398	10.0339122
5040	(2007 YX1)	55200	2.85402209	0.591182315	16.3467409	152.843535	331.7934694	137.5856472
5041	(2007 YB2)	55200	3.09816302	0.684620472	17.7669169	211.4570783	333.9124848	120.4942352
5042	(2007 YV29)	55200	1.37315964	0.356803267	21.8779659	321.7543258	59.3618927	134.207641
5043	(2007 YM56)	55200	1.24729223	0.311700969	6.4257052	306.5305339	273.6404801	78.3671569
5044	(2007 YN56)	55200	1.07885216	0.330963648	11.5044125	251.7874484	99.0066175	354.9337784
5045	(2007 YO56)	55200	1.28045983	0.357054721	15.6098773	333.3152554	287.732845	13.1261622
5046	(2007 YP56)	54465	1.99045887	0.707435498	1.6754027	92.8653737	273.4168551	17.168292
5047	(2007 YQ56)	55200	1.14065164	0.287935111	26.4554869	273.0269002	276.0696461	165.153962
5048	(2007 YR56)	54467	2.0133564	0.516034857	10.334944	336.1018999	97.6139442	7.4642489
5049	(2007 YS56)	55200	0.94244989	0.283523754	6.2391975	63.6087181	274.6936411	160.6439648
5050	(2007 YT56)	55200	1.29458345	0.287673756	5.9987054	81.6727512	302.5627459	178.4789281
5051	(2007 YU56)	55200	2.37204175	0.569993479	13.2375997	163.1622997	283.0551057	202.473701
5052	(2007 YV56)	55200	1.57570944	0.622104708	6.2467624	265.5212053	102.5831952	33.0514672
5053	(2007 YZ58)	55200	1.31183777	0.657696582	24.7408057	166.4652446	95.8018669	19.7355247
5054	(2007 YY59)	54468	2.49538996	0.591323012	0.6837583	300.964384	121.8985075	9.4035963
5055	(2008 AD)	55200	1.70669306	0.679302649	6.9232153	338.0350149	224.0803074	296.4171814
5056	(2008 AE)	55200	1.27616076	0.130848016	11.5712288	26.8259338	132.1866896	103.6358575
5057	(2008 AG1)	55200	1.78764614	0.560549089	4.2419159	204.4896683	196.3999182	321.5122796
5058	(2008 AX1)	55200	1.54701379	0.47612804	12.9021235	126.3091026	263.3692029	41.2860648
5059	(2008 AF3)	55200	1.20823466	0.19212191	2.0706838	22.7258408	109.1958114	162.5424322
5060	(2008 AE4)	55200	2.33071781	0.559558039	5.5205215	28.5534829	101.8033848	195.5906934
5061	(2008 AF4)	55200	1.38265819	0.410620484	8.91917	293.3201316	109.4271977	110.2697942
5062	(2008 AG4)	55200	1.13982132	0.192248091	6.7517569	286.5330311	110.3884825	281.5925368
5063	(2008 AH4)	54478	2.28848873	0.636131358	67.2870881	66.3758574	117.2340446	346.8973592

#	Object	Epoch	a	e	i	w	Node	M
5064	(2008 AU26)	55200	1.39485563	0.102344823	2.6617305	128.5533158	299.7231994	116.4188296
5065	(2008 AS28)	54479	2.42885538	0.731740224	19.9053503	248.118825	86.5166501	23.1428895
5066	(2008 AT28)	55200	2.20890693	0.44354654	8.863859	263.751651	130.4555138	262.0021231
5067	(2008 AU28)	55200	2.00712319	0.53570404	4.243136	40.1348608	108.5883568	239.446961
5068	(2008 AV28)	55200	1.18956413	0.336716026	15.2949714	5.8739431	304.6337283	353.2732909
5069	(2008 AW28)	54479	1.74467787	0.340970717	22.2706137	288.1350283	118.1488226	37.0116423
5070	(2008 AX28)	55200	2.25069974	0.426733154	2.1576792	73.850376	322.7240625	248.031372
5071	(2008 AZ30)	55200	1.33268295	0.653734883	2.3446757	25.6933448	326.774144	139.5504075
5072	(2008 AB31)	55200	1.60177224	0.320315054	30.02583	255.5338017	303.1073753	311.4315793
5073	(2008 AF32)	55200	1.21063032	0.110802197	27.1827871	79.9784282	105.3527331	117.5165221
5074	(2008 AG33)	55200	1.46091695	0.337451606	15.9974017	155.5106153	38.3909785	21.1199902
5075	(2008 AH33)	55200	2.10528162	0.547288804	36.7708864	176.7960922	335.9211693	228.414165
5076	(2008 AJ33)	55200	3.28401116	0.655919563	11.1000973	308.7469621	98.3920928	127.9498867
5077	(2008 AK33)	55200	2.21868875	0.719507895	34.0948288	88.4753327	283.838717	232.4054284
5078	(2008 AL33)	55200	2.54243683	0.508493743	1.7358488	142.9181708	358.3240735	167.9470687
5079	(2008 AM33)	55200	1.86158242	0.412359719	1.5142036	222.3190611	307.9636141	260.6488591
5080	(2008 AN33)	55200	2.57323652	0.691289189	10.6777647	27.2713971	30.0139631	186.5683272
5081	(2008 AP33)	55200	1.33837719	0.481288129	8.2463334	257.3853866	122.558986	138.392143
5082	(2008 AZ110)	55200	2.65040676	0.519662409	3.8339397	291.639811	302.9112976	118.1712568
5083	(2008 AO112)	54477	1.38892901	0.365006476	4.7712942	342.5957144	94.5698989	4.0486765
5084	(2008 BC)	55200	2.41939751	0.599846122	14.2795895	157.6726629	291.9613628	193.7790925
5085	(2008 BE)	55200	1.97795149	0.414284313	3.0381382	59.1707417	74.7100657	248.843063
5086	(2008 BS2)	55200	1.58684856	0.471218323	14.1416904	350.9595126	311.158549	158.9589352
5087	(2008 BT2)	55200	1.17322433	0.080730262	3.0753835	201.9298387	333.6843335	144.6527754
5088	(2008 BU2)	55200	1.3070819	0.724382138	38.4552549	212.807964	115.3701159	213.3947001
5089	(2008 BV2)	55200	2.03353338	0.399764306	5.7415077	147.4020848	332.445176	243.7697056
5090	(2008 BW2)	55200	1.39449502	0.331593376	4.1073369	319.8233715	117.5756452	88.8006572
5091	(2008 BX2)	55200	0.85669245	0.340864114	3.1510685	350.2362371	337.134024	301.7945638
5092	(2008 BC15)	54496	2.20838877	0.713781179	3.5271247	263.158648	309.8605643	346.5190679
5093	(2008 BD15)	55200	1.07858065	0.13985891	32.1545462	113.6133401	130.3735596	161.2905511
5094	(2008 BE15)	54496	2.50073631	0.661050596	2.5198587	64.7521606	122.5326877	350.1011335
5095	(2008 BH16)	54502	1.78341135	0.53084167	31.7357285	84.2936579	130.8798602	334.4236111
5096	(2008 BN16)	54496	2.21778903	0.688007645	5.5203579	98.389388	308.0295228	15.6850403
5097	(2008 BO16)	55200	2.4335957	0.808481503	8.6094952	254.2725654	133.9998839	196.0717475
5098	(2008 BP16)	55200	0.82841457	0.649606808	29.164793	155.3509204	139.9515881	101.300638
5099	(2008 BQ16)	55200	1.95626361	0.362621437	14.6694192	213.7961967	331.6527557	238.0792502
5100	(2008 BR18)	55200	2.217291	0.596616392	8.1157254	138.9656651	107.8590845	170.8474858
5101	(2008 BC22)	55200	2.19491525	0.449091118	3.9021342	219.8264385	349.3266978	188.9986899
5102	(2008 CF)	55200	1.92504386	0.469937171	1.9055581	26.0160714	124.2664263	252.7345268
5103	(2008 CG)	55200	1.02797464	0.251609071	19.3565352	230.8999776	139.0270947	43.5974104
5104	(2008 CH)	55200	2.33157736	0.689182618	22.1144093	294.401807	133.5439701	206.8079334
5105	(2008 CJ)	54499	2.35491499	0.564643324	2.2121406	2.3615969	132.0184031	359.7738018
5106	(2008 CK)	54500	2.08112752	0.523401372	7.2652078	341.3083636	131.497381	5.8717786
5107	(2008 CM)	55200	1.56633901	0.408380034	35.9946925	130.5951564	279.6263261	1.5118248
5108	(2008 CO)	55200	1.17616246	0.011573179	8.0753096	79.3726765	319.3091751	275.4298825
5109	(2008 CP)	55200	1.1205465	0.07774479	13.5943115	17.0970259	140.0696161	202.2531512
5110	(2008 CQ)	55200	1.252447	0.364810915	8.6820865	281.401775	134.2372365	173.0921151
5111	(2008 CH1)	55200	1.20136909	0.324788518	14.2430447	138.227973	131.201062	64.4871681
5112	(2008 CJ1)	54499	1.67040647	0.32217946	23.3131937	327.3737679	129.2991319	17.7228024
5113	(2008 CL1)	55200	0.96102398	0.137470316	30.0249478	4.6619395	344.107238	155.7315798
5114	(2008 CN1)	55200	0.77053071	0.348186029	7.2166468	7.0830921	331.6270689	81.0255814
5115	(2008 CQ1)	55200	2.19300151	0.43331744	3.3416268	303.6145872	290.4436632	158.642166
5116	(2008 CR1)	55200	1.14946263	0.46239083	45.7715319	339.6533889	315.5342794	81.4324723
5117	(2008 CS1)	54504	1.22867021	0.371530349	29.8016838	95.0543926	134.1642397	317.9811206
5118	(2008 CT1)	54500	0.89079017	0.456441285	0.3710063	126.219336	138.0968509	280.3335733
5119	(2008 CY4)	54504	1.84300234	0.421377149	19.0097944	43.4843112	132.1510122	345.4945927
5120	(2008 CZ4)	55200	1.29927553	0.379025968	14.5901516	103.5455917	317.3233257	141.4719558
5121	(2008 CA5)	55200	1.86181087	0.592938866	24.9913476	272.8749231	331.6759176	242.9896552
5122	(2008 CE5)	54507	1.08411927	0.663958868	26.0795443	208.7870044	137.062005	90.6283981
5123	(2008 CA6)	55200	1.70967445	0.46863555	5.9170943	271.2607167	309.99739	266.9464747
5124	(2008 CB6)	55200	1.60300615	0.407921022	0.306519	299.7050117	241.1755377	320.5834412
5125	(2008 CC6)	55200	1.26185787	0.773915996	9.1381792	136.4360754	146.9232523	79.6092299
5126	(2008 CD6)	54505	2.01791703	0.603737913	1.0776252	235.9357188	178.5557297	22.9324871
5127	(2008 CE6)	55200	1.90050757	0.477385879	0.8064735	323.2563244	149.6764605	271.094862
5128	(2008 CL20)	55200	0.76642728	0.319549096	15.9437692	349.6592683	321.3325869	137.4398491

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5129	(2008 CM20)	55200	1.30586911	0.22283287	21.0769981	226.4211961	307.0193844	70.1208668
5130	(2008 CX21)	54505	1.93158095	0.51244369	28.948425	48.2131921	136.7059967	346.7185046
5131	(2008 CY21)	55200	0.96973154	0.253761791	10.6777379	54.0506818	322.9514164	92.0533496
5132	(2008 CZ21)	55200	1.43192965	0.144491504	17.0527688	68.4721229	335.589837	117.0058838
5133	(2008 CA22)	55200	2.03218533	0.726105457	8.0560798	322.1633598	308.0605952	198.4368971
5134	(2008 CB22)	55200	2.35907661	0.655785533	7.3120969	33.1509706	51.4674219	201.4467797
5135	(2008 CC22)	54508	1.96187151	0.567392618	4.4174026	248.2254964	327.8301969	339.8093046
5136	(2008 CD22)	55200	1.57582373	0.322672011	10.1786192	8.9728521	148.5536575	336.6986066
5137	(2008 CE22)	55200	1.22039378	0.311989536	4.8061987	110.2639064	318.887921	187.6456193
5138	(2008 CF22)	55200	2.0293417	0.564194551	2.1338424	43.7643852	141.732844	225.2918988
5139	(2008 CJ22)	54505	1.44304212	0.278885894	20.4734194	332.1150353	140.0472927	15.2953739
5140	(2008 CP23)	55200	2.20619208	0.45327202	3.7751027	82.5386727	137.0035729	180.0633785
5141	(2008 CD70)	55200	1.07771751	0.082511382	12.5898234	332.875102	141.0575169	273.9828013
5142	(2008 CE70)	54506	1.46986336	0.3388176	25.6979455	147.9605282	318.572862	15.9807281
5143	(2008 CH70)	55200	0.85305516	0.319646228	6.5361292	188.0203319	144.7052743	304.4280722
5144	(2008 CJ70)	55200	1.40558076	0.151728791	17.3385808	69.8487757	145.7169927	351.1579977
5145	(2008 CK70)	55200	1.10274184	0.468839779	6.0591866	105.7864998	145.8199297	175.5177755
5146	(2008 CL70)	54508	2.18085624	0.671551021	21.3633341	274.7218384	144.2450886	17.4131991
5147	(2008 CN70)	55200	0.85182199	0.379529905	24.4565585	114.3195797	150.7527502	52.3451064
5148	(2008 CC71)	54509	1.45331678	0.368661165	1.874016	222.2935523	339.2305739	333.5268335
5149	(2008 CD71)	55200	1.45598016	0.749867442	47.2047764	321.807526	334.2789702	339.6961684
5150	(2008 CL72)	55200	2.27647329	0.433222035	15.6294888	29.0955203	150.2742247	184.9039295
5151	(2008 CM74)	55200	1.08893085	0.146737986	0.8551261	242.6379822	321.6179516	192.7783351
5152	(2008 CG116)	55200	2.45662131	0.586168709	5.1922854	197.5736214	310.184106	176.0889293
5153	(2008 CH116)	55200	0.66272918	0.587507861	20.3801457	248.0915782	85.9963021	52.7567009
5154	(2008 CJ116)	55200	1.74795184	0.339079423	13.3254046	44.4358652	335.2872484	22.703678
5155	(2008 CK116)	54509	1.39687091	0.582556902	15.1404039	78.4755635	314.7392835	38.0126625
5156	(2008 CL116)	55200	3.07964693	0.740706497	18.6411289	112.9638678	126.7086533	114.1682806
5157	(2008 CM116)	55200	1.63057947	0.663345105	18.7144571	355.7040023	0.1661447	90.111558
5158	(2008 CN116)	55200	1.21959641	0.361118505	2.3880443	87.7278424	135.7140218	103.2658336
5159	(2008 CO116)	55200	1.63771441	0.441003576	17.0082457	300.3283721	140.6793535	346.4464938
5160	(2008 CP116)	55200	2.47346825	0.569698381	0.4506535	174.5436148	316.8350827	177.7694837
5161	(2008 CQ116)	55200	1.00385121	0.196122384	20.9397868	74.3440674	322.8786617	42.4779369
5162	(2008 CR116)	55200	1.47044693	0.267585349	30.0976628	203.17284	334.9775709	2.6073491
5163	(2008 CS116)	55200	2.77850323	0.63982978	8.0934374	120.8157462	352.7513146	153.4674278
5164	(2008 CR118)	55200	1.83864415	0.510781947	3.9236985	156.9144476	121.6358303	207.2629112
5165	(2008 CW118)	54507	1.77329081	0.409631121	2.2587997	333.8747063	127.8349611	15.3215124
5166	(2008 CX118)	55200	1.14474296	0.035315139	2.4198924	178.427558	106.781414	56.3702027
5167	(2008 CY118)	54509	1.30400646	0.37349969	21.6342367	94.148931	321.2798155	46.9410392
5168	(2008 CZ118)	55200	2.21015171	0.417905186	22.9349099	96.4871717	22.3392966	221.1987428
5169	(2008 CA119)	54511	1.61477161	0.369090342	9.8419818	214.974801	330.9768341	343.7621187
5170	(2008 CC119)	55200	2.58133659	0.54270637	25.0079103	137.239451	350.5682086	174.3495995
5171	(2008 CD119)	54510	1.00507728	0.358677882	10.2636474	56.4679756	326.1219905	81.9966579
5172	(2008 CE119)	55200	1.21222542	0.178221247	7.7714955	49.6050719	147.5031081	112.475294
5173	(2008 CG119)	55200	1.66395154	0.476687238	41.2906986	148.6658583	302.0903687	334.9593247
5174	(2008 CH119)	55200	1.82392192	0.340950149	3.5348678	142.8823028	0.9401032	273.8842465
5175	(2008 CK119)	55200	1.19360102	0.155794217	9.3060026	129.4274101	327.400719	196.5907535
5176	(2008 CB175)	55200	1.3443042	0.238893062	9.0803045	344.6207828	148.3614584	83.394719
5177	(2008 CC175)	55200	0.95536131	0.501330719	10.1737145	166.3887052	125.7135189	280.7111318
5178	(2008 DB)	55200	1.05449653	0.232851424	4.2231796	274.961143	141.578341	330.3422299
5179	(2008 DC)	55200	1.36815807	0.233990697	17.4597522	46.5881742	345.7643029	157.9338707
5180	(2008 DD)	55200	1.94209712	0.464320647	15.3617194	186.732042	355.5825134	240.5962655
5181	(2008 DE)	55200	1.71517082	0.413396576	14.7525496	179.0429865	56.0041861	263.790864
5182	(2008 DJ)	55200	1.98288279	0.603394108	5.0508734	117.7632557	319.3097932	258.8332744
5183	(2008 DV)	55200	1.73039731	0.451576887	31.3167845	258.4134837	309.0920502	253.9434434
5184	(2008 DW)	55200	1.98779666	0.361685886	6.742968	10.1236515	161.4279891	233.187679
5185	(2008 DX)	55200	2.30625087	0.501916234	10.0687876	16.4610883	155.4611466	185.8502709
5186	(2008 DY)	55200	2.69529169	0.611971865	8.6600543	101.765228	82.7187522	144.9893722
5187	(2008 DA4)	55200	2.42538456	0.625929745	4.2151836	317.5273098	146.5929884	187.5638182
5188	(2008 DG4)	54526	2.48638296	0.641876863	1.8487143	300.0127505	164.3583818	10.9285872
5189	(2008 DL4)	55200	0.929348	0.122835586	3.2057889	42.195617	341.3348952	148.6998427
5190	(2008 DF5)	54525	0.8753046	0.196362614	41.9090927	28.5729105	338.1047855	139.3989894
5191	(2008 DG5)	55200	1.25583171	0.242707167	5.7065533	59.6003132	244.096707	344.2417511
5192	(2008 DH5)	54526	1.52836262	0.507498871	14.5176611	76.7068544	163.52677	332.0904402
5193	(2008 DJ5)	55200	1.24870449	0.415755173	8.1049558	326.4933212	358.9077392	349.7063154

#	Object	Epoch	a	e	i	w	Node	M
5194	(2008 DK5)	55200	1.55507793	0.614834152	4.2766925	80.6519949	345.9247945	11.9152823
5195	(2008 DL5)	55200	1.09523618	0.47349336	18.6262788	243.842406	163.7918709	282.3486669
5196	(2008 DG17)	55200	1.83691246	0.449513672	41.1233726	214.9773023	324.4403731	256.927122
5197	(2008 DT22)	54525	1.72129759	0.43619911	21.2822766	111.0340347	341.177332	27.8892719
5198	(2008 DU22)	55200	1.37985139	0.39838543	3.0805253	70.7849845	155.347216	20.2672043
5199	(2008 DV22)	54526	2.71381035	0.636596663	11.0789805	56.1830804	153.1468615	350.5621943
5200	(2008 DW22)	55200	1.74999924	0.382589341	0.8356159	75.0698988	105.7660537	278.4674418
5201	(2008 DX22)	54527	1.34309442	0.469793232	20.8198254	272.4481581	156.3676383	38.8696052
5202	(2008 DY22)	55200	0.82118853	0.225834393	19.0592932	0.4171377	342.6161812	350.0792297
5203	(2008 DH23)	55200	1.65540091	0.258821542	28.3321366	92.4514726	1.2904226	6.9110596
5204	(2008 EE)	55200	0.98160641	0.211894973	16.1615069	332.3693995	343.6372274	159.719434
5205	(2008 EF)	54529	2.19441687	0.550825337	7.9821176	83.7291694	354.6884073	21.9000519
5206	(2008 EG)	55200	0.94292268	0.739061526	26.7841611	355.4773853	327.4836398	270.3030013
5207	(2008 EH)	55200	2.33417581	0.586716504	3.7267092	186.0536267	28.5324509	171.7459621
5208	(2008 EJ)	55200	1.11047684	0.48253288	40.3981248	208.7534522	166.7565237	310.3038293
5209	(2008 EL)	55200	1.10321834	0.538875913	3.1688001	102.2161797	184.8752085	150.9597982
5210	(2008 EM)	54528	1.1546076	0.147820519	26.2179096	256.0883577	345.4952803	295.0351514
5211	(2008 EN)	54527	1.65561952	0.426084373	24.9130466	309.4482185	153.6948229	23.3016214
5212	(2008 EO)	55200	1.18794834	0.46883053	16.1726066	258.0434645	158.7347605	205.4871026
5213	(2008 EP)	55200	0.84237012	0.259777951	15.8351431	21.4162554	348.1687647	274.1815343
5214	(2008 EQ)	55200	1.75358388	0.458365159	2.7234731	35.500526	168.719355	271.3212585
5215	(2008 ER)	55200	1.21497513	0.25676202	9.4073389	167.0721358	144.6563579	9.8674774
5216	(2008 ES)	55200	2.30322467	0.753386692	9.0177402	164.4387426	134.5077056	155.7414205
5217	(2008 EH1)	54527	1.40362434	0.231624013	20.7718229	223.6940541	340.8855175	328.7638015
5218	(2008 EJ1)	55200	2.08342635	0.529067793	38.8153552	78.8618375	337.5066725	305.2389371
5219	(2008 EK1)	55200	1.54352284	0.557130756	39.3921644	256.2238866	162.9067101	21.6708656
5220	(2008 EE5)	55200	0.94467433	0.07150541	44.8129294	20.0742624	321.2918753	146.1948776
5221	(2008 ES5)	54530	1.96706835	0.640555056	3.9275033	300.7238797	139.0292544	19.2297817
5222	(2008 EV5)	55200	0.95851535	0.083536945	7.4360713	234.7437442	93.4252347	151.8416059
5223	(2008 EW5)	55200	2.00122904	0.4548405	2.5332455	134.3012839	21.9712486	236.1512824
5224	(2008 EX5)	55200	1.36033495	0.391229975	3.3883341	66.0676577	16.3204327	97.9153051
5225	(2008 EY5)	55200	0.6265009	0.626495136	5.0669012	105.3699557	246.7755711	34.9980662
5226	(2008 EZ5)	55200	2.08768254	0.509331138	8.0797479	227.1865197	15.7007221	200.1082692
5227	(2008 EL6)	55200	1.72830049	0.479947667	13.1569686	38.1060731	177.7906799	272.3042409
5228	(2008 EM6)	54531	1.84564869	0.491766049	9.1662068	54.7601152	165.2058285	342.1931392
5229	(2008 EN6)	55200	1.48279413	0.468732106	27.4160544	344.0689359	339.3843895	237.7124391
5230	(2008 EO6)	55200	1.90368318	0.400271148	19.0897413	306.983823	173.0630127	275.3105072
5231	(2008 EP6)	55200	1.2093747	0.292931809	17.7311975	130.2729503	303.3377026	189.5472158
5232	(2008 EM7)	55200	1.23837612	0.243336536	33.1433681	42.7000771	347.8164101	230.3982427
5233	(2008 EP7)	55200	1.31986029	0.296016482	5.7302487	84.3094899	162.210953	25.5276291
5234	(2008 EQ7)	55200	1.41037459	0.22267638	5.9688876	65.223941	142.5102505	9.3947977
5235	(2008 ER7)	55200	1.48688844	0.623872128	2.2462943	80.6268603	323.7956779	62.148152
5236	(2008 ET7)	55200	1.42308991	0.138218911	18.1076716	82.8297678	357.1582637	99.0086637
5237	(2008 EZ7)	55200	1.79711761	0.448514077	9.3070474	4.8272427	168.7069623	270.6720603
5238	(2008 EA8)	54535	0.95961185	0.677274478	1.8078588	145.9786431	225.127461	97.7594485
5239	(2008 EB8)	54533	1.85837543	0.360168749	23.3088175	120.9853942	353.8299116	25.1913806
5240	(2008 ED8)	55200	2.19425913	0.548215629	7.7286489	2.6607094	169.7414158	200.6013487
5241	(2008 EA9)	55200	1.05916312	0.079780318	0.4241212	335.9443724	129.4257873	298.1036486
5242	(2008 EB9)	55200	1.56282923	0.217169044	21.3533064	251.2676568	341.7767347	283.7728847
5243	(2008 EE9)	55200	1.32500773	0.527663114	9.9718549	249.5965993	180.585848	109.4013439
5244	(2008 EF9)	55200	2.14599061	0.600059906	6.635535	76.5915626	152.9277418	193.8455301
5245	(2008 EG9)	54535	1.40933329	0.388224588	2.8046995	280.5575574	326.2404736	321.9058719
5246	(2008 EJ9)	54536	1.85424182	0.312147197	40.6040423	212.2927849	345.7149974	346.0674592
5247	(2008 EM9)	55200	1.95955096	0.851535185	9.3967442	181.6839775	229.7388329	261.1819963
5248	(2008 EA32)	55200	0.61594676	0.304898299	28.2639306	181.8132721	100.9854703	146.624872
5249	(2008 EB32)	55200	1.96628358	0.414030119	5.3785489	47.9099083	182.4437215	205.8288817
5250	(2008 EC32)	54536	2.03948681	0.648809579	1.8739283	98.0280096	356.2338518	16.139948
5251	(2008 EF32)	54536	1.62646017	0.521733813	1.7327104	112.2804597	349.1708556	22.2092464
5252	(2008 EG32)	55200	1.60039901	0.429779912	4.8297766	134.1591695	350.0579747	340.9381765
5253	(2008 EE68)	54537	1.42346319	0.099920048	33.1638395	68.3307551	166.6443262	299.1309806
5254	(2008 EJ68)	54530	1.5677702	0.59273278	11.2639333	95.2896528	166.1542555	329.8603189
5255	(2008 EK68)	54530	1.77839768	0.505283891	4.952717	129.7494124	344.2145703	15.7449047
5256	(2008 EL68)	54531	1.21022506	0.19152261	0.5773078	341.5466759	148.9241585	24.2105535
5257	(2008 EM68)	54533	1.53121829	0.574550642	4.7460194	266.6286421	350.7056056	332.2720565
5258	(2008 EU68)	54537	1.48869562	0.650133264	3.0456821	171.4869792	229.4891051	47.0109889

#	Object	Epoch	a	e	i	w	Node	M
5259	(2008 EV68)	55200	1.45966458	0.284431321	3.2651917	288.8572836	191.3423056	38.5175292
5260	(2008 EY68)	55200	0.74504637	0.75989255	19.7980494	198.9503088	175.5220559	36.3789238
5261	(2008 EC69)	55200	2.75247505	0.619025992	24.8017601	178.2018853	93.3417287	124.4033821
5262	(2008 ED69)	55200	2.886556	0.749600547	36.282772	172.7236584	149.8911249	109.4643291
5263	(2008 EN82)	55200	2.50298119	0.552793722	11.9853215	194.5972801	207.036871	231.7674851
5264	(2008 EV84)	54537	2.58166317	0.617578695	13.1032953	205.7616492	350.3603408	355.2268582
5265	(2008 EW84)	54538	1.75439494	0.584369855	5.3568504	82.9656655	170.5606462	335.9405406
5266	(2008 EX84)	55200	2.34197746	0.550756712	15.3643013	31.8609585	174.7144325	172.8686493
5267	(2008 EY84)	55200	1.03044775	0.17478742	4.3332443	260.5007147	174.5972865	340.9111165
5268	(2008 EZ84)	55200	1.01066055	0.151218067	13.1599846	268.1760207	169.540952	0.3506148
5269	(2008 EB85)	54539	1.26189492	0.45388689	10.800749	104.6142865	171.8517313	307.4524501
5270	(2008 EC85)	54539	3.15825892	0.736290147	55.6990016	272.0540792	169.0357321	13.2615981
5271	(2008 ED85)	54538	1.50193646	0.348904171	4.8308004	204.4853264	352.6018324	348.7111239
5272	(2008 EE85)	55200	1.21712859	0.385566198	6.5353244	270.7625534	7.5151455	65.5509084
5273	(2008 EF85)	54539	2.08326356	0.540657689	4.8415966	144.2833465	355.2835907	9.0535644
5274	(2008 EG85)	54539	1.5984956	0.399004385	20.5994101	316.4974322	172.0666899	19.3226516
5275	(2008 EH85)	54539	1.12582566	0.265731252	25.1981214	301.0782703	352.3178099	269.1534244
5276	(2008 EJ85)	55200	1.21020246	0.261351167	6.6705903	302.0902688	169.3179827	167.1803509
5277	(2008 EK85)	55200	1.37865804	0.275387327	6.5886439	165.3527584	355.0239438	49.6470986
5278	(2008 EL85)	54540	1.92034175	0.562789775	2.2974485	310.5751416	161.5691774	16.7526627
5279	(2008 EM85)	55200	1.99499501	0.717765629	8.0365008	33.2335881	46.9230448	248.4976723
5280	(2008 ER90)	55200	1.57172063	0.176114831	20.395928	12.1651637	176.5215464	324.018384
5281	(2008 EZ97)	55200	2.40537327	0.47809132	8.530247	196.776998	68.9841699	154.1630393
5282	(2008 FB)	55200	1.97018318	0.470743238	20.4692388	14.512668	178.6127099	228.4147164
5283	(2008 FC)	55200	1.51591511	0.344767285	5.4383639	349.9146159	170.7289557	354.6733896
5284	(2008 FE)	54552	1.7496696	0.408154664	13.0751614	350.7661649	181.5910875	3.838644
5285	(2008 FG)	55200	1.79235979	0.676467227	39.328191	308.3796742	358.7038245	217.9589442
5286	(2008 FH)	54557	1.5862506	0.505271622	3.465177	264.1024363	5.2025466	331.2678907
5287	(2008 FJ)	54554	2.37010563	0.565825379	13.0064975	315.8279219	187.5102828	11.2663585
5288	(2008 FK)	54554	1.91828678	0.574805064	3.0250148	300.543913	182.834291	17.268506
5289	(2008 FM)	54553	1.87517215	0.471691655	10.0245509	311.7767003	189.0265397	15.8562431
5290	(2008 FN)	55200	1.89447489	0.595915557	44.6798343	54.9587868	50.631142	273.0844177
5291	(2008 FO)	55200	1.24061962	0.276062193	0.7396574	141.197164	336.0573092	142.8212829
5292	(2008 FP)	55200	2.59619453	0.891552008	1.9182553	123.5530998	187.1399406	142.6916121
5293	(2008 FE5)	55200	1.4237829	0.309939626	19.4677079	97.2719051	7.2158655	62.9470046
5294	(2008 FF5)	54556	2.27702412	0.965133358	2.6209597	19.9117864	15.3110611	12.1259655
5295	(2008 FH5)	54554	1.9596469	0.519865414	0.7558515	51.4511029	179.4169139	347.9196511
5296	(2008 FW5)	55200	2.14014127	0.544611342	13.4736518	359.5304481	160.7373059	212.5588526
5297	(2008 FN6)	55200	1.63964488	0.358466735	13.6601803	226.3870163	42.7684321	264.4034805
5298	(2008 FS6)	55200	1.29470473	0.146979323	5.170432	209.9851039	21.0732829	43.2662642
5299	(2008 FT6)	55200	2.13905365	0.42563467	13.5841041	52.0796325	42.0330475	269.1100347
5300	(2008 FU6)	55200	1.32376654	0.569164207	12.824164	129.0281304	192.9344319	6.1073889
5301	(2008 FW6)	55200	2.26619985	0.635501582	6.5053766	34.3622677	80.2991486	201.5007968
5302	(2008 FX6)	55200	0.92343681	0.126326072	11.1299292	324.7626786	10.0129815	219.4522121
5303	(2008 FY6)	55200	1.81311244	0.386856385	25.549424	106.6849897	10.159893	292.9286856
5304	(2008 FJ7)	55200	1.1335323	0.291080614	0.4658873	359.8605893	99.7608654	224.217134
5305	(2008 FK7)	55200	1.88754815	0.393431951	1.4324607	251.4552683	346.9922255	227.038341
5306	(2008 FL7)	54559	2.08012285	0.514493184	2.0878508	119.2733522	41.7302411	10.1082975
5307	(2008 GD)	55200	1.19753166	0.776792909	21.7568278	292.7331509	32.0712889	75.3755338
5308	(2008 GE)	55200	1.27176397	0.209024632	9.9308022	95.2823339	39.4788336	118.2276448
5309	(2008 GF)	55200	1.50045334	0.337517509	22.9736413	97.962639	187.0673048	284.0594236
5310	(2008 GG)	54559	1.37530925	0.815114207	20.861766	286.5249037	111.0940022	50.2534185
5311	(2008 GH)	54560	2.53820484	0.770157568	2.0769955	131.8600138	321.4107799	14.6455183
5312	(2008 GJ)	55200	1.9636537	0.471087728	4.8397013	192.7851052	256.8071709	277.8629981
5313	(2008 GK)	54561	1.68133939	0.574898923	8.5541152	272.3682065	191.7042121	27.8901945
5314	(2008 GO)	54560	1.70862893	0.375049177	4.8816904	159.265326	14.2644162	8.7843942
5315	(2008 GR)	54560	1.75095709	0.443184485	3.147705	224.6289333	17.0762021	342.7917821
5316	(2008 GV)	54561	2.7306623	0.609265619	30.1014448	177.5819002	15.6468414	0.3652736
5317	(2008 GX)	55200	2.27482433	0.484635767	2.6212759	108.9078432	144.5620113	158.3504592
5318	(2008 GD1)	55200	2.29522282	0.612609224	5.0290374	93.7701007	184.5988616	159.2634652
5319	(2008 GE1)	55200	1.65159223	0.247773991	6.7174952	312.8550664	129.7573315	33.1955694
5320	(2008 GF1)	55200	1.22939262	0.465343741	1.4213866	276.2075472	16.4974848	58.0066936
5321	(2008 GF2)	54563	1.85880707	0.373244376	16.8354505	193.9276897	16.7866201	354.3919971
5322	(2008 GG2)	55200	1.58734608	0.278005124	13.0174001	0.121022	198.7839022	313.4443264
5323	(2008 GK2)	54566	2.12420511	0.579950062	11.2636913	64.2002204	189.7429228	345.4560361

#	Object	Epoch	a	e	i	w	Node	M
5324	(2008 GL2)	55200	1.12326597	0.128880692	5.1701912	235.6675757	16.5619193	123.571836
5325	(2008 GM2)	55200	1.05193393	0.157229213	4.0961833	278.2680621	195.1118934	288.3572795
5326	(2008 GP3)	55200	1.17174896	0.392461204	4.3554202	277.9343938	18.7518927	81.3791126
5327	(2008 GQ3)	54570	2.17815479	0.522945683	25.451087	142.0821442	356.2178233	12.4702708
5328	(2008 GR3)	55200	1.53256282	0.311448333	1.3633395	113.0676067	130.6090022	306.7779245
5329	(2008 GS3)	55200	0.85458365	0.374590336	28.7443073	187.3444078	196.9064326	241.7958349
5330	(2008 GU3)	55200	2.43001404	0.508925861	13.0523758	2.4342025	181.9548419	171.3167398
5331	(2008 GV3)	55200	2.39651404	0.604907913	72.9160472	72.9747389	208.6828915	150.2012249
5332	(2008 GX3)	54566	1.88903372	0.476775992	9.5388528	25.031639	196.8682901	352.9044436
5333	(2008 GY3)	55200	2.57256708	0.51193121	16.7994279	150.3741019	16.0478733	157.3134204
5334	(2008 GZ3)	54566	2.0617287	0.489365391	1.0640265	168.2254957	34.3634084	359.4606179
5335	(2008 GA4)	55200	1.76950641	0.669064806	6.322559	0.5317199	83.1984674	311.4182932
5336	(2008 GB4)	55200	1.37923359	0.272466908	30.1293874	328.8599141	199.5498136	42.5734781
5337	(2008 GL20)	55200	0.89380616	0.202134197	6.8868988	220.7498403	198.8635297	144.4428613
5338	(2008 GO20)	55200	1.89284289	0.490858358	2.247986	160.5862391	119.6404222	209.5183133
5339	(2008 GP20)	55200	1.96005969	0.441528171	32.6538896	93.0271611	31.5354767	257.1476352
5340	(2008 GU20)	55200	1.92327433	0.412474008	5.6131645	349.5513899	203.5733304	236.082691
5341	(2008 GV20)	55200	2.00906668	0.622631538	18.1733131	182.190409	146.9372516	163.083982
5342	(2008 GW20)	55200	2.38919905	0.609486586	1.7653265	119.7567047	43.6573237	176.3409154
5343	(2008 GB21)	55200	1.45987557	0.414316991	1.4998153	305.7029939	192.3041352	20.6087208
5344	(2008 GX21)	55200	1.90719287	0.415964495	9.5310787	166.6210464	27.0379418	238.7044424
5345	(2008 GY21)	55200	1.0725514	0.378360061	1.8686446	259.490758	197.9341277	261.2754792
5346	(2008 GA110)	55200	2.85506286	0.574320778	2.9402046	72.6386117	163.8541041	121.5145517
5347	(2008 GB110)	55200	1.83772509	0.3266911	36.1196426	315.0816662	203.6125043	270.1937733
5348	(2008 GC110)	55200	1.09110503	0.154225365	13.9817787	142.5907431	206.520515	54.1980402
5349	(2008 GD110)	55200	1.0222982	0.254340969	5.3516324	100.8883473	213.2367924	160.118865
5350	(2008 GE110)	55200	2.067227	0.396197484	3.8891764	153.5087202	53.6399253	206.5758542
5351	(2008 GF110)	55200	1.27476548	0.578923339	13.8094441	348.694354	38.9354886	220.5309791
5352	(2008 GH110)	55200	1.27278535	0.280773663	29.2451161	248.6549771	205.946084	163.7685979
5353	(2008 GI110)	54575	1.55895245	0.821545698	13.6006377	29.1070624	38.5228698	29.0619526
5354	(2008 GE128)	54571	1.82491846	0.46407145	1.7220577	347.2744568	182.7140076	12.4570655
5355	(2008 HE)	55200	2.26636512	0.950059576	9.7856495	185.354774	215.2735219	194.2393663
5356	(2008 HG)	55200	2.10836498	0.509097639	5.9431971	197.5959251	43.2162312	191.8856253
5357	(2008 HH)	55200	1.36618998	0.355693078	16.3178161	115.9377114	196.7350341	329.1056219
5358	(2008 HJ)	55200	1.6320016	0.406505988	0.9273272	204.0760083	47.4956899	277.8926068
5359	(2008 HK)	54583	2.40068601	0.554844211	17.4601989	191.9769232	34.2612241	357.0006361
5360	(2008 HL)	54582	1.95444084	0.566232789	41.7175165	229.6567975	92.3525772	339.4725755
5361	(2008 HW1)	55200	2.5830894	0.96071687	10.6108476	248.8889243	129.2267683	134.3142895
5362	(2008 HX1)	54583	2.20539636	0.584797411	6.8208817	47.592498	212.7848539	348.7051663
5363	(2008 HY1)	54583	1.63050816	0.43413915	24.6086155	108.3999788	33.9103893	30.4541272
5364	(2008 HZ1)	55200	1.94625106	0.674475734	31.5384733	310.9851818	31.7126714	173.8213147
5365	(2008 HA2)	54584	1.76490815	0.404586074	1.3503804	314.2121572	215.724721	19.5610432
5366	(2008 HB2)	54587	1.67664493	0.37837511	0.6920645	167.8995557	41.9925914	4.0178526
5367	(2008 HC2)	55200	1.24369955	0.522724936	45.5017553	142.9791538	211.8239775	349.2413696
5368	(2008 HD2)	55200	1.46898094	0.446444009	2.9569731	255.4237433	40.5275182	307.6904894
5369	(2008 HE2)	55200	2.02472806	0.459166711	9.4921249	187.037562	38.8943834	208.0291959
5370	(2008 HF2)	55200	1.69808332	0.745958752	14.5432227	153.6787922	208.8646812	231.7008322
5371	(2008 HD3)	55200	1.13133169	0.335716131	52.0079118	223.7436842	222.0998454	252.3499318
5372	(2008 HE3)	55200	2.60738076	0.718875791	30.9545986	130.6365644	210.5206121	107.6047615
5373	(2008 HJ3)	54588	1.84571197	0.473524589	18.2312562	134.0751774	45.4658935	13.2149757
5374	(2008 HO3)	55200	2.89349871	0.659514792	13.807218	126.5855224	208.2582491	88.4809746
5375	(2008 HQ3)	55200	1.3557159	0.262391044	1.7851591	334.8207017	211.7687909	42.3704695
5376	(2008 HR3)	55200	2.41327846	0.660550921	3.917094	60.2168727	228.8192831	148.0456728
5377	(2008 HS3)	55200	1.3509192	0.225794845	8.176197	4.5742068	227.8442733	15.8584971
5378	(2008 HT4)	54588	1.41470105	0.229674974	16.7096499	138.4318748	36.1177879	27.8133
5379	(2008 HU4)	54600	1.0967808	0.078187396	1.3220729	339.636079	222.9982813	26.8593671
5380	(2008 HV4)	55200	1.42622331	0.277930753	20.816918	249.4472806	224.0694669	73.5365391
5381	(2008 HY37)	55200	1.72054797	0.354531929	35.1550274	1.5654068	26.1192037	89.0413174
5382	(2008 HA38)	55200	1.48482733	0.134233868	17.5934694	21.1184212	45.5404851	121.4676426
5383	(2008 HB38)	55200	1.85065581	0.491695681	1.0253637	208.6787061	103.3435125	203.3857927
5384	(2008 HC38)	54589	1.27988775	0.480988075	1.5016008	272.0821465	213.5041628	42.3380466
5385	(2008 HE66)	55200	1.38950274	0.155061949	6.9432019	59.5520859	203.3169776	341.6376184
5386	(2008 JC)	55200	1.04560098	0.463188369	2.5217389	58.248401	47.7991889	265.4040101
5387	(2008 JE)	55200	0.98398636	0.093157966	6.9648775	316.7719489	39.1864091	131.490095
5388	(2008 JF)	55200	1.90740726	0.392755329	19.8150859	235.6359188	90.7792575	171.032746

#	Object	Epoch	a	e	i	w	Node	M
5389	(2008 JG)	55200	1.05218106	0.296202504	7.9068797	242.2466024	128.8679763	71.992711
5390	(2008 JJ)	55200	1.74272577	0.378434097	44.5688431	219.953713	72.0490728	230.6736072
5391	(2008 JN)	55200	1.0766412	0.803313916	31.9649641	158.7228049	216.4885315	118.1555463
5392	(2008 JO)	55200	1.50880184	0.545288332	5.3672993	194.7265565	276.935179	356.9967983
5393	(2008 JP)	55200	1.54656462	0.648553165	18.3619161	307.1530724	31.2337734	265.3781608
5394	(2008 JQ)	55200	1.0163397	0.107977816	13.7237865	259.60072	220.7211372	318.5189896
5395	(2008 JU2)	55200	2.24792205	0.524842786	10.7265911	175.6063195	65.681862	173.5148815
5396	(2008 JV2)	55200	2.08346728	0.519014826	3.1859171	138.3864853	48.5328498	210.6565267
5397	(2008 JW2)	54600	2.45065365	0.630020834	8.7377895	141.273122	36.3151113	13.984005
5398	(2008 JL3)	55200	2.15808434	0.544294579	0.8995863	155.6157337	40.2446399	196.732671
5399	(2008 JZ7)	55200	2.65727329	0.649048623	24.2324721	69.6818171	219.0184173	120.6344965
5400	(2008 JA8)	55200	2.31623619	0.503708354	24.2688559	231.0630813	62.7198338	157.3126373
5401	(2008 JO14)	55200	2.00393958	0.795888193	4.9718137	349.539591	117.1207558	230.8173409
5402	(2008 JP14)	55200	1.85475267	0.618292162	10.7188033	206.2997668	129.140686	203.1888725
5403	(2008 JQ14)	55200	2.46131764	0.518317519	14.517094	22.2876729	204.0045201	149.532859
5404	(2008 JR14)	55200	1.64574586	0.375265043	7.8573627	333.1625246	231.3230968	292.4719046
5405	(2008 JT19)	55200	2.0171425	0.415928365	14.0832305	304.1709962	198.9520387	248.5865827
5406	(2008 JV19)	55200	0.98568894	0.248141511	7.2490618	310.638833	142.221581	351.1043007
5407	(2008 JW19)	55200	1.67912519	0.629100399	17.3565734	289.3516006	56.6419819	233.1955452
5408	(2008 JM20)	55200	1.02210139	0.591995415	22.4886912	27.6936182	64.9686765	284.9644312
5409	(2008 JO20)	55200	3.3023494	0.608573771	6.7755296	36.768021	130.2687951	97.739986
5410	(2008 JL24)	55200	1.03827003	0.106607161	0.5497784	281.9458154	225.8510391	272.5883931
5411	(2008 JO24)	55200	1.80025591	0.291134103	26.6566518	142.8283229	132.8936131	240.4468775
5412	(2008 JP24)	55200	1.24883935	0.277437653	1.1530786	125.2260598	41.4553879	103.7625497
5413	(2008 JM26)	54600	1.36923614	0.30931061	5.1903624	301.7343427	231.693131	32.6369547
5414	(2008 JR26)	55200	1.39427275	0.177575754	16.8122477	96.5238916	230.7731083	289.4689197
5415	(2008 JS26)	55200	2.15303422	0.509150347	7.2001061	200.4590072	73.5757877	175.1273758
5416	(2008 JY30)	55200	2.37297289	0.759394968	10.9127681	345.082788	3.8479758	144.7246293
5417	(2008 JZ30)	55200	2.58269812	0.529232064	25.4600309	91.744174	161.1090619	150.9857085
5418	(2008 JD33)	54601	1.89590898	0.464719789	4.208449	140.643116	66.5822019	8.8746544
5419	(2008 JT35)	55200	2.57131507	0.587704368	3.8812447	158.3637622	112.5013311	133.9021965
5420	(2008 KO)	54615	2.14457688	0.736168543	14.6748829	269.8502611	73.3246335	344.2661389
5421	(2008 KP)	55200	1.10066922	0.78980732	59.8254431	344.9718556	62.4678667	29.5843941
5422	(2008 KQ)	55200	1.5276686	0.317594521	12.4892298	262.5724825	87.9658942	238.7571905
5423	(2008 KS)	55200	0.97440601	0.156862712	25.4910654	152.7739049	246.0913734	97.7106561
5424	(2008 KT)	55200	1.01548606	0.086520656	1.9911366	106.0396854	241.5830109	113.2146049
5425	(2008 KV2)	55200	0.84907805	0.411624698	5.0567001	347.3316374	67.2532748	225.1618196
5426	(2008 KW2)	55200	1.44497436	0.693823803	37.3958168	128.7111116	248.0649212	287.2208729
5427	(2008 KX2)	55200	2.39519193	0.551976869	5.0298802	176.6275095	74.5323458	154.4922996
5428	(2008 KZ5)	55200	1.83985289	0.453032553	8.3822807	194.14834	142.7547253	190.7393549
5429	(2008 KA6)	54616	1.18516736	0.334305053	5.9968949	117.5578185	234.3905519	292.843411
5430	(2008 KB6)	54622	1.66560392	0.446266828	22.0691485	245.7734811	69.6596734	335.2558845
5431	(2008 KC6)	54616	1.3538907	0.43931759	11.8054126	265.6660504	72.1912859	318.805812
5432	(2008 KD6)	55200	1.31035268	0.443392158	24.135589	127.7751053	262.8955939	317.4204978
5433	(2008 KE6)	54618	1.68535108	0.519719766	3.4238095	224.1625276	113.7752367	334.5958557
5434	(2008 KF6)	54617	2.32621116	0.553136436	5.769834	159.7184454	64.1002649	6.1616508
5435	(2008 KN11)	55200	1.70833697	0.528971461	5.2728623	245.907301	89.4820376	227.3749095
5436	(2008 KB12)	55200	2.78320371	0.581875716	26.81515	164.1301441	73.0250938	126.5396204
5437	(2008 KV28)	55200	1.70407058	0.389005452	21.0434866	116.6090663	227.0396152	205.4641448
5438	(2008 LA)	55200	2.2298259	0.574664483	1.6694403	143.9255493	162.1594395	157.0845008
5439	(2008 LB)	54622	2.4772564	0.611814617	4.3091529	211.4734879	80.1053481	352.4424201
5440	(2008 LC)	54624	2.13187908	0.527360501	8.6190948	207.9686737	81.9452481	350.5514721
5441	(2008 LD)	55200	0.89189694	0.15465577	6.5416247	201.4279445	250.9111054	112.2686898
5442	(2008 LE)	54619	2.23766642	0.532064268	6.2077353	189.9669256	94.0419097	351.2657187
5443	(2008 LC2)	54621	1.01912152	0.516772923	25.0074953	304.3100078	78.8139359	287.0273581
5444	(2008 LG2)	55200	0.85435485	0.228906618	3.0553836	336.9862181	86.1811294	199.5313189
5445	(2008 LH2)	55200	0.97922563	0.275839015	5.7618215	249.0275846	249.4995366	314.2823956
5446	(2008 LW8)	55200	1.67531723	0.393624293	17.2612273	118.4847875	223.2131966	240.198771
5447	(2008 LN16)	55200	2.14085136	0.421741895	7.8148106	260.4933501	36.4266604	168.9262945
5448	(2008 LQ16)	55200	1.70670496	0.737558857	7.264797	17.7662665	142.1223501	273.6820649
5449	(2008 LV16)	55200	2.08716681	0.623737195	4.6854661	121.0330922	237.2973884	164.3832856
5450	(2008 LW16)	55200	1.06600726	0.103270593	29.6899271	347.8898177	98.0169662	337.8694506
5451	(2008 MZ)	55200	2.62007708	0.606253365	7.7211235	291.8791245	69.3238162	109.9977255
5452	(2008 MG1)	55200	0.78337589	0.820374281	5.692565	108.6185543	352.6802813	256.5824896
5453	(2008 MH1)	55200	2.69492421	0.582183077	7.9802327	13.6503341	304.3133451	109.5848257

#	Object	Epoch	a	e	i	w	Node	M
5454	(2008 MN1)	55200	1.37635823	0.247589749	37.2275048	244.0483473	106.1553873	299.5221501
5455	(2008 MP1)	54650	1.88755331	0.564191704	3.7803136	243.3539837	105.518468	339.9165878
5456	(2008 MQ1)	55200	1.39214489	0.256570871	2.3235736	162.2958727	108.7301252	336.4676853
5457	(2008 MR1)	55200	2.27375937	0.464809181	5.6227146	32.1504884	313.0862223	144.1327018
5458	(2008 MU1)	55200	1.89636754	0.43604681	40.7755608	56.5193837	296.3679925	180.7073292
5459	(2008 MV1)	54650	2.25471437	0.648807161	1.985921	199.3626239	12.6253255	14.7882158
5460	(2008 MB5)	55200	1.42749639	0.363868406	20.4045732	278.5414152	115.279243	255.5485478
5461	(2008 NA)	55200	0.96195971	0.302493419	9.9199451	52.8645784	104.8384434	303.8886938
5462	(2008 NB)	55200	2.45807739	0.554994469	20.471642	75.8297991	283.2489454	125.1156439
5463	(2008 NU)	55200	2.73188068	0.538395512	10.9154019	18.4892311	290.4876129	120.0218781
5464	(2008 NX)	55200	1.3192531	0.206647851	0.5980611	26.029043	258.2691055	356.5331654
5465	(2008 NS1)	55200	2.41553266	0.806583944	14.7391138	207.2841523	309.5472326	153.7535295
5466	(2008 NO3)	55200	2.78883444	0.672415966	11.6695359	206.7395663	36.4324297	119.3196928
5467	(2008 NP3)	55200	1.00454749	0.3344977	1.437908	329.0545942	77.8138694	92.0180508
5468	(2008 NQ3)	54667	2.45193068	0.581916509	27.1763531	155.302793	109.3896548	9.2446279
5469	(2008 OM)	55200	2.46819622	0.530491715	7.4376604	0.8358489	299.3893658	134.9090015
5470	(2008 ON)	55200	1.46063914	0.207736897	30.4462622	5.5178631	320.7849544	278.5235809
5471	(2008 OO)	55200	2.10484638	0.700733041	5.4909557	253.305403	306.3353943	194.3277115
5472	(2008 OO1)	55200	2.42588921	0.617224182	9.3317727	314.1221351	304.3602687	146.8146936
5473	(2008 OX1)	55200	1.20640168	0.277478023	29.735108	281.3374547	304.8953256	81.1086272
5474	(2008 OV2)	55200	2.38098597	0.574474985	15.2941038	307.5997555	286.4444423	162.7416509
5475	(2008 OX2)	55200	1.04766446	0.601937379	6.6397629	251.8287717	220.3290142	10.14958
5476	(2008 OY2)	55200	2.63993539	0.622912086	1.1048105	153.3689178	129.8402512	124.6953342
5477	(2008 OA6)	55200	2.14151963	0.501201563	9.0428295	140.4596876	134.1918996	175.2779724
5478	(2008 OC6)	55200	0.92288678	0.199183789	21.8458459	295.8223952	177.6439449	129.3407533
5479	(2008 OS7)	55200	1.90547778	0.645955044	7.0451125	72.717558	137.4433965	220.661494
5480	(2008 OT7)	55200	1.13579405	0.314208906	1.7768635	93.1346869	124.7200386	119.7695089
5481	(2008 OM8)	55200	2.09927246	0.448031637	8.4384551	206.2347022	129.7611591	160.2450325
5482	(2008 ON8)	54683	1.6480174	0.354480034	5.159414	183.6596022	130.8435908	0.2126656
5483	(2008 OO8)	55200	2.05101242	0.506741831	6.3553226	344.6850522	302.0542308	181.700112
5484	(2008 OP8)	55200	2.20673799	0.67726196	5.2297855	37.3389213	186.3153955	178.1767939
5485	(2008 OQ8)	55200	2.30621543	0.464629122	1.5952956	189.2688667	134.5513693	144.7189005
5486	(2008 OX8)	55200	1.6028238	0.250874889	8.1587971	0.1780181	322.215434	243.9127465
5487	(2008 OB9)	55200	3.21801145	0.756464254	13.5047176	238.1472116	203.0606613	57.560874
5488	(2008 OC9)	54682	1.15299684	0.249661079	29.2934153	266.5946906	310.6938975	65.9154931
5489	(2008 OS9)	55200	1.60119845	0.648064796	19.1227703	288.1532283	133.6005063	220.4577902
5490	(2008 ON10)	55200	1.16157909	0.160440178	7.1082726	242.8396619	131.2939926	1.3002726
5491	(2008 ON13)	55200	2.21841509	0.814934662	5.9036066	46.4667986	144.0786497	182.0053013
5492	(2008 PE1)	55200	2.16873743	0.506973029	4.4528474	7.216128	300.8927284	161.5110147
5493	(2008 PF1)	54687	1.36103519	0.494439626	2.7566326	284.0685364	129.6918067	321.2365903
5494	(2008 PG1)	54682	1.36013492	0.334575338	10.7655185	241.7768048	135.2984878	329.4954423
5495	(2008 PF2)	55200	2.45871544	0.572586716	6.4080277	170.9157536	133.4813445	134.2860332
5496	(2008 PG2)	55200	1.13865522	0.042356551	8.9552214	67.4977146	325.1226941	343.3979909
5497	(2008 PH3)	55200	2.12750657	0.461321408	5.9833017	238.3879857	89.9586273	160.2254697
5498	(2008 PJ3)	54687	1.77670645	0.76026016	11.3688838	347.9684582	89.6281478	334.7844093
5499	(2008 PK3)	54685	1.8920229	0.598468279	17.0862455	108.9903041	122.8353524	23.3114708
5500	(2008 PL3)	55200	2.27929366	0.445092008	5.4744236	352.898163	355.1719271	136.379
5501	(2008 PW4)	55200	1.16121133	0.272753263	2.7018827	294.6981374	117.7210213	341.1612275
5502	(2008 PG7)	54686	1.53485527	0.369892425	39.8342679	253.3555788	137.9008147	322.2259995
5503	(2008 PH9)	55200	2.91372255	0.559337933	35.6248911	247.930809	341.3183203	136.8217599
5504	(2008 PJ9)	55200	2.54551228	0.661962752	4.7695212	135.0810486	115.3591114	137.7216918
5505	(2008 PK9)	54687	1.63665189	0.724461415	27.3911796	108.0193824	318.487723	335.6505093
5506	(2008 PR9)	55200	0.94303624	0.509831	3.3053261	75.3951661	19.0576355	107.2911828
5507	(2008 PV16)	54694	1.86748577	0.59155643	33.9262445	260.1719677	146.2492871	337.4454441
5508	(2008 QB)	54699	1.20710986	0.73961213	35.7538663	314.1553637	147.000474	317.5904843
5509	(2008 QC)	55200	2.27421506	0.519441406	11.1119913	301.4480888	17.0585246	147.1912308
5510	(2008 QF)	55200	2.07760711	0.377842558	3.7772189	136.1879659	192.7106681	163.5116229
5511	(2008 QY)	55200	1.16699481	0.581298171	13.5836042	254.7451513	2.0698051	77.695806
5512	(2008 QZ)	55200	2.16946016	0.423693995	6.8316548	194.0571144	160.7192699	147.9922152
5513	(2008 QA1)	55200	2.22388744	0.514870271	26.4689556	28.2409485	336.7404383	138.5287815
5514	(2008 QC1)	55200	2.65260668	0.610277056	3.5935328	177.9471393	137.0813481	116.9706262
5515	(2008 QD1)	55200	2.25355024	0.446862088	6.9118768	261.0458261	72.8324067	146.2447341
5516	(2008 QM2)	54705	1.54404238	0.312950695	23.7353889	8.9389966	332.6927785	356.7623359
5517	(2008 QT3)	55200	2.01237957	0.527542352	7.2259448	160.6542271	272.0700346	131.981026
5518	(2008 QU3)	55200	0.8690406	0.247915009	14.0792088	241.1931911	303.6555698	13.8915027

#	Object	Epoch	a	e	i	w	Node	M
5519	(2008 QS11)	55200	1.86064106	0.482202999	12.5024954	30.5447473	11.6078944	168.1653908
5520	(2008 QT11)	55200	1.37448112	0.377944803	6.8006508	134.1647176	128.5520544	338.0386792
5521	(2008 QU11)	54707	1.78217543	0.495383788	7.9822199	122.7542719	156.8259135	18.7023924
5522	(2008 QV11)	54706	0.9081986	0.449394945	8.172336	7.3560916	114.2833735	242.2900258
5523	(2008 QW11)	55200	2.31758956	0.542666781	2.7281197	240.3174296	101.8262215	136.688912
5524	(2008 RT)	55200	2.48469617	0.567681463	21.3523723	13.1136771	17.6663409	113.131206
5525	(2008 RU)	54712	2.11416847	0.648652141	7.2181174	274.5129094	140.2062297	344.225414
5526	(2008 RV)	55200	2.27139715	0.562229954	2.277251	192.3791397	119.9508171	147.066762
5527	(2008 RW)	55200	1.98686976	0.533996285	4.400119	255.6559805	135.987634	157.1961814
5528	(2008 RE1)	55200	2.26436214	0.525491416	5.8298418	352.7347813	5.1704196	136.358569
5529	(2008 RG1)	55200	1.31565341	0.442772959	13.0826738	257.2322228	347.9509011	12.2578101
5530	(2008 RH1)	55200	1.06362052	0.161760874	7.4686177	147.3085347	350.915062	296.2259195
5531	(2008 RJ1)	55200	2.16717932	0.471355369	16.3284901	54.1692427	191.9870645	210.2465329
5532	(2008 RK1)	55200	2.7906025	0.569443246	6.5642282	347.2383597	351.1409814	104.8941208
5533	(2008 RQ24)	55200	2.17278059	0.428923662	6.0310716	144.4965956	201.1385012	150.7331814
5534	(2008 RR24)	55200	1.28180765	0.452358647	32.5190292	103.1493047	340.5766035	279.2533862
5535	(2008 RS24)	54716	2.09046553	0.613676883	17.1500914	264.2748203	160.197599	338.2341139
5536	(2008 RT24)	54717	1.81518319	0.418205064	6.9253245	212.6701947	162.0138919	348.4830114
5537	(2008 RW24)	55200	1.75022596	0.500231247	2.1609425	38.6913512	14.9272329	182.3125145
5538	(2008 RX24)	55200	2.28768287	0.440372394	2.0298946	340.1809986	7.4131488	137.9985791
5539	(2008 RY24)	55200	2.2175622	0.459042716	4.3779548	130.4999925	285.2209628	112.8356639
5540	(2008 RZ24)	55200	2.17764579	0.561807654	13.9351639	122.2461039	165.7615084	167.6095958
5541	(2008 RS26)	55200	3.02196535	0.589026429	19.6210974	299.7966451	100.5339374	74.2177615
5542	(2008 RT26)	55200	2.24640742	0.459806654	2.2302747	30.5071838	7.2139877	132.976699
5543	(2008 RE80)	55200	1.48175064	0.245943524	16.5938359	26.0732958	182.0675706	37.9707522
5544	(2008 RG98)	55200	2.19046873	0.768411501	10.7386564	168.4520577	340.1211124	98.4638617
5545	(2008 RM98)	55200	2.56659098	0.636550317	1.8524393	166.0047337	285.3552171	86.8125639
5546	(2008 RP108)	55200	2.12496243	0.415965751	5.6952787	148.5356352	180.5461741	162.4851756
5547	(2008 SA)	55200	1.32593568	0.332629635	2.6373219	64.1196118	354.460114	271.8798015
5548	(2008 SC)	54730	1.09153592	0.701896976	16.8175857	122.5329208	6.8726743	313.4955492
5549	(2008 SD)	55200	2.03667228	0.73900189	17.4897936	219.3412929	27.6586485	181.1487267
5550	(2008 SE)	55200	2.36145604	0.485746118	8.6234443	156.1080862	216.249215	125.072717
5551	(2008 SO)	55200	1.33030365	0.233233331	7.1364224	71.9119255	191.1512034	16.2969207
5552	(2008 SP)	54734	1.69198379	0.350880105	16.5322493	129.7733467	187.3195798	19.5485546
5553	(2008 SQ)	55200	1.64026404	0.354756963	12.7057911	319.7046879	4.9688798	239.1435568
5554	(2008 SR)	55200	2.00194113	0.403901625	4.4734251	138.4223434	256.602273	153.3450448
5555	(2008 SS)	55200	0.9284207	0.479239215	21.1263291	134.9894221	5.0936823	59.6094685
5556	(2008 ST)	55200	0.96399616	0.125894862	1.9059959	291.1190563	189.5373528	19.4406154
5557	(2008 SN1)	55200	2.66282374	0.511960342	6.0503499	84.478284	279.2874806	107.1805981
5558	(2008 SO1)	55200	2.87832694	0.601136368	12.4361958	245.0441635	199.1649235	80.6777437
5559	(2008 SQ1)	55200	2.95910525	0.582550402	6.70024	150.9839657	269.9567403	77.5954465
5560	(2008 SR1)	55200	2.37516101	0.648679278	16.7259069	115.4790256	179.2367575	138.6470901
5561	(2008 ST1)	54733	1.38169363	0.301429937	8.5815519	144.3665663	179.0598868	20.2290417
5562	(2008 SU1)	55200	2.14798896	0.755394073	8.9276404	195.2240605	287.6775242	120.297428
5563	(2008 SW1)	55200	2.48108556	0.535778817	16.3255187	185.2406301	189.4796126	115.8035532
5564	(2008 SZ1)	55200	2.1838334	0.526592104	4.622205	172.8550573	183.3246988	144.1516198
5565	(2008 SP7)	55200	2.74545844	0.530351461	9.9388529	338.7121233	34.9773847	101.0377928
5566	(2008 SQ7)	55200	1.35399088	0.297772254	16.5702008	272.3531726	184.9942405	243.0233186
5567	(2008 SR7)	55200	1.32215043	0.192329758	15.3134709	296.7483817	324.6164295	21.8090662
5568	(2008 ST7)	55200	1.93467507	0.513988511	2.4506372	321.6425355	347.887899	187.4100264
5569	(2008 SV7)	55200	1.6251842	0.331253882	4.4190803	165.5081851	231.064614	208.7503561
5570	(2008 SW7)	54733	1.61264604	0.350777826	17.4700333	186.7731484	178.7030675	357.6498158
5571	(2008 SX7)	55200	2.43625078	0.483636121	6.4925209	6.0778579	348.0855856	116.9917533
5572	(2008 SF8)	55200	2.78576019	0.598097332	5.9383078	0.1359093	357.1899533	99.4205411
5573	(2008 SV11)	55200	2.61872794	0.722243952	8.3005012	102.897881	15.6464593	74.7055351
5574	(2008 SW11)	55200	1.13428668	0.408220649	7.4329187	206.878812	28.9168533	114.4333912
5575	(2008 SH82)	55200	2.44282037	0.590636184	4.5621125	157.3266461	269.126406	101.8991655
5576	(2008 SJ82)	55200	2.37782838	0.578447473	9.7121924	218.2245102	135.3551455	127.7145958
5577	(2008 SC85)	55200	2.4204096	0.522522566	6.2494277	167.5602763	256.3571983	97.9586983
5578	(2008 SD85)	55200	0.8829296	0.40717955	23.3774275	209.1028286	2.5567236	312.8447955
5579	(2008 SE85)	55200	1.62434954	0.525084633	29.5751582	294.8167623	177.5518272	181.5746128
5580	(2008 SG148)	54740	1.34596236	0.202057945	27.2151035	15.999278	7.4676868	351.6606394
5581	(2008 SH148)	54738	2.63044521	0.638787177	3.4040551	199.1919158	203.4207276	353.3243019
5582	(2008 SJ148)	54741	1.21107492	0.386235546	2.6457872	72.8542851	202.6699116	52.3006562
5583	(2008 SX148)	54739	1.12477256	0.308285347	14.6736739	252.9728074	354.8450378	84.4557219

#	Object	Epoch	a	e	i	w	Node	M
5584	(2008 SY148)	54740	1.24925322	0.192761554	28.7335386	164.3060187	187.2827079	12.7415058
5585	(2008 SU150)	54746	1.97465769	0.392342126	2.4731604	93.5875488	262.8382811	4.054532
5586	(2008 SV150)	54739	1.15426016	0.089571127	22.4892733	344.9115794	4.0068789	15.0880229
5587	(2008 SW150)	55200	1.78644305	0.561953214	20.0138045	51.8489407	39.6109563	156.8379143
5588	(2008 SY150)	55200	1.38494884	0.328745623	6.9627092	120.740221	192.9746367	305.3428884
5589	(2008 SZ150)	55200	1.40689976	0.329751849	13.0676502	128.7415752	188.6110018	296.8124619
5590	(2008 SX245)	55200	1.99224923	0.459550867	11.8152668	292.7925692	209.1364543	93.615939
5591	(2008 SS251)	55200	2.52822143	0.511258063	4.0937847	197.1216374	165.0700162	117.2159934
5592	(2008 TA)	54743	1.38123526	0.647785903	1.5268286	259.0931858	354.6261364	36.3699202
5593	(2008 TB)	55200	2.47401514	0.604148163	27.391038	209.1312161	188.0753014	110.3711911
5594	(2008 TC)	54741	2.0633394	0.500642849	2.6775842	106.4425201	211.1990723	14.7812118
5595	(2008 TD)	55200	0.8962883	0.338118777	5.0669873	144.4185274	357.8705911	71.993453
5596	(2008 TE)	55200	1.51846339	0.452424637	0.305895	297.3525669	1.185824	269.6847791
5597	(2008 TF)	55200	0.95682797	0.518592771	21.0611492	139.3689641	10.186135	29.3182956
5598	(2008 TG)	54746	2.53404679	0.533976441	1.683415	99.3660468	243.8730627	8.1353716
5599	(2008 TH)	54742	1.36876004	0.571278923	9.5328107	112.1019075	7.3035444	318.16227
5600	(2008 TJ)	54741	1.56025636	0.316692272	3.5021144	341.2345041	7.3822354	10.2598153
5601	(2008 TK)	54742	2.1247771	0.516957768	15.4265239	351.1714337	12.6626414	2.4118187
5602	(2008 TL)	54741	1.75229102	0.481113657	8.9021	312.7018686	7.7710154	16.2980239
5603	(2008 TZ)	55200	0.95289317	0.39694815	1.5051328	127.4731193	9.761199	41.92495
5604	(2008 TA1)	55200	1.39658381	0.448492593	14.829892	145.5711599	22.0930482	154.7082771
5605	(2008 TB1)	54742	2.68054394	0.58954619	22.957235	120.4260468	183.8065529	14.1244473
5606	(2008 TC1)	54743	2.1330617	0.556848576	7.8668102	120.6935508	187.1440725	16.6181034
5607	(2008 TD1)	54750	2.18939131	0.490777412	1.9001331	15.5900293	5.8975754	358.5090505
5608	(2008 TE1)	55200	1.94064375	0.471818679	15.0233545	3.0290474	9.2089773	166.4707196
5609	(2008 TB2)	55200	2.06705041	0.489597804	3.9095668	9.4821614	10.1013049	149.0760377
5610	(2008 TC2)	55200	1.06587246	0.310457969	5.757466	71.7737515	196.6439649	122.7030157
5611	(2008 TD2)	55200	1.53022383	0.334355173	4.0167491	315.8774468	16.0641154	262.7511301
5612	(2008 TE2)	54743	1.49708895	0.325767547	3.1785601	2.9729873	10.6357619	359.1836595
5613	(2008 TF2)	55200	0.99046277	0.358806981	15.9727986	295.1717039	196.6431514	15.6334591
5614	(2008 TQ2)	55200	1.84446559	0.420471771	3.8777913	235.0179102	225.6230967	149.009831
5615	(2008 TR2)	55200	1.70812068	0.273014153	33.862361	354.4366356	28.1701305	201.6864542
5616	(2008 TC3)	54746	1.30820103	0.312064944	2.5422	234.4489654	194.1011383	330.7541045
5617	(2008 TX3)	55200	1.17963958	0.18673531	2.3809655	249.7305258	193.3829875	299.712719
5618	(2008 TY3)	54749	1.84024096	0.392223793	3.2475116	327.1726837	25.5764594	10.0325963
5619	(2008 TZ3)	55200	1.59497788	0.391818055	8.8107743	219.1093404	44.2975765	291.3088544
5620	(2008 TA4)	55200	1.08755572	0.122880244	15.485202	61.7747102	16.5915396	341.7661817
5621	(2008 TB4)	54749	1.81946034	0.446222517	41.8639431	138.3020311	194.4137218	14.2437799
5622	(2008 TC4)	55200	0.7803688	0.554883413	10.6546836	324.2140316	212.6801464	160.9132459
5623	(2008 TD4)	55200	1.82165063	0.617343116	14.4723891	54.731503	222.0630242	209.3877036
5624	(2008 TE4)	55200	1.46607717	0.367785087	6.3235236	325.0686202	355.6731117	276.4420906
5625	(2008 TF4)	55200	1.89427057	0.319642821	24.0536247	113.1383888	213.4770311	197.7541818
5626	(2008 TF9)	55200	2.55498655	0.536055159	41.0078768	324.4107687	6.0260595	119.433096
5627	(2008 TN9)	54748	1.19907829	0.303208581	1.6246342	290.1558476	7.5028158	46.3445034
5628	(2008 TX9)	54748	1.9154449	0.5110766	7.6598643	223.3542718	199.9147783	345.9284419
5629	(2008 TY9)	55200	1.4322273	0.279328296	8.2857378	158.6012224	205.2033215	266.4222168
5630	(2008 TM10)	54749	2.27532707	0.650764657	22.3500974	229.1061979	203.0297638	349.2394774
5631	(2008 TP10)	54751	2.17478485	0.608841425	3.6980593	59.9536385	229.8796207	26.4537912
5632	(2008 TQ10)	55200	2.22377166	0.461974792	24.7086099	296.8468667	10.1086338	162.9354246
5633	(2008 TR10)	55200	2.11934568	0.4667671	5.3921221	35.5831687	256.5581655	180.9926437
5634	(2008 TS10)	55200	1.25739801	0.201677284	1.4594169	345.6721779	5.5022046	332.394065
5635	(2008 TV25)	55200	1.88479225	0.51301806	9.0428823	296.9797752	164.0744767	145.9812026
5636	(2008 TL26)	54749	2.63009808	0.575120382	17.853607	171.5351644	198.5088517	1.3218227
5637	(2008 TM26)	55200	1.67359619	0.451315993	3.687112	343.4770277	336.6815565	226.9791154
5638	(2008 TN26)	55200	1.82427644	0.633286512	9.4218816	22.2826151	253.7095346	122.3095038
5639	(2008 TP26)	55200	1.09449751	0.287345272	13.3182755	241.6350455	12.382085	213.6525528
5640	(2008 TQ26)	55200	1.79025255	0.49185439	4.1610443	61.0306052	238.633174	215.2360953
5641	(2008 TS26)	54748	1.91738681	0.56692715	0.7081737	301.899002	16.4740037	14.8990296
5642	(2008 TT26)	55200	1.34532606	0.257262766	8.4755002	190.01061	210.5592222	270.6666201
5643	(2008 TB27)	55200	1.77240505	0.360682568	38.0249699	169.3584899	265.0734757	187.3138392
5644	(2008 TD27)	55200	2.20203511	0.640832144	10.9528414	198.8362548	286.6972148	104.0508376
5645	(2008 TE157)	55200	2.73745919	0.62421356	1.9765143	77.4155431	26.2206459	77.295208
5646	(2008 TJ157)	55200	2.76215582	0.548139976	12.224285	133.6899349	203.6608598	107.6512764
5647	(2008 TK157)	55200	2.39244209	0.515123404	4.5421858	217.6149476	220.3485477	101.8242636
5648	(2008 UB)	55200	1.49843879	0.158169327	35.8664073	342.4277221	26.126678	250.3584109

#	Object	Epoch	a	e	i	w	Node	M
5649	(2008 UC)	55200	1.97603669	0.452732299	10.2507231	337.9914714	99.2598238	133.2756305
5650	(2008 UD)	54759	0.99820747	0.282023399	11.8912353	50.6411532	205.7474066	100.8108193
5651	(2008 UF)	55200	1.64956901	0.371579961	9.1343406	175.4425975	206.647695	207.1525109
5652	(2008 UQ)	54760	1.07897354	0.386526836	11.8787906	181.8449716	33.036114	164.4458772
5653	(2008 UR)	55200	1.3131471	0.269983844	4.8711119	229.2221762	206.3578129	260.5637825
5654	(2008 US)	54760	1.47245436	0.56396479	5.5569068	90.7815858	207.9206555	28.5079471
5655	(2008 UU)	54762	2.79054973	0.616275578	12.7316726	25.1958494	31.423369	354.796779
5656	(2008 UV)	54762	1.63103028	0.339225264	13.0245624	185.3255474	205.617277	359.5400691
5657	(2008 UX)	55200	0.8175548	0.681326252	21.7377523	158.0798919	37.587391	91.9006479
5658	(2008 UD1)	55200	1.71580769	0.464429038	6.4841271	6.4927016	154.3435538	101.1176993
5659	(2008 UE1)	54764	2.23811196	0.48979932	8.4200141	156.2056756	197.9237989	11.5674011
5660	(2008 UF1)	54763	1.86369897	0.633812216	5.0004235	274.4671949	32.7087255	19.7942306
5661	(2008 UM1)	54761	1.71236676	0.553897356	4.6044111	110.3819132	208.9519116	20.0353591
5662	(2008 UT1)	54764	1.63579737	0.464543497	43.4072245	293.002223	34.5847682	24.7122258
5663	(2008 UU1)	55200	1.6073129	0.750507238	12.0601723	118.6179622	157.5149252	236.6471027
5664	(2008 UR2)	55200	1.42009168	0.36896417	2.362862	123.9933915	210.8327616	280.8298217
5665	(2008 US2)	55200	1.52793498	0.278900894	4.4102015	14.6300627	35.4703025	219.2708635
5666	(2008 UT2)	55200	1.80411305	0.483146411	7.5738674	130.8795678	208.5578853	194.9169283
5667	(2008 UL3)	54765	1.29433981	0.22394619	6.577541	240.7037554	205.781789	324.1109597
5668	(2008 UM3)	54766	1.45962942	0.250976092	10.7033719	211.7444004	213.7332033	341.6340552
5669	(2008 UN3)	55200	1.05275283	0.233635551	24.8386229	130.3325276	41.6428878	287.7864123
5670	(2008 US4)	55200	2.33296039	0.63410254	13.1977374	72.5895331	31.460185	104.9170968
5671	(2008 US5)	55200	1.80691425	0.329344516	29.740877	59.7647276	24.982745	144.9459107
5672	(2008 UT5)	55200	2.28107942	0.554546153	1.613982	32.5775104	37.6827283	114.6387606
5673	(2008 UU5)	54768	2.48572071	0.508306783	15.5837925	170.5560844	209.3375815	4.8393582
5674	(2008 UV5)	54766	2.57152881	0.600525661	3.5061119	325.2895889	40.5266688	5.9240995
5675	(2008 UW5)	55200	1.83161895	0.389659524	9.4293607	204.2230925	298.0363483	100.9109711
5676	(2008 UA7)	54769	1.61262311	0.359201732	10.0571955	148.5578191	213.7873848	15.6751138
5677	(2008 UB7)	55200	1.23527504	0.593574954	2.0193638	287.638303	219.6205579	268.0064777
5678	(2008 UC7)	54766	1.32051211	0.444393795	1.0062834	39.7899073	81.8106746	320.8273807
5679	(2008 UE7)	55200	1.64835971	0.448286188	3.9522949	48.5964397	81.2656281	163.345599
5680	(2008 UF7)	55200	1.6491602	0.605349507	19.8866751	212.7796216	55.0295606	259.7084277
5681	(2008 UG7)	54767	1.22528359	0.09371836	40.7268352	119.9437964	208.3808312	53.7407022
5682	(2008 UK90)	55200	2.00341	0.3717502	34.6454714	91.3485327	48.8979429	92.2168917
5683	(2008 UL90)	55200	0.69487216	0.38014436	24.3081055	183.584043	81.1821141	175.5447927
5684	(2008 UM90)	54767	1.96572025	0.464387431	5.8999617	126.9109776	179.3589599	25.9511377
5685	(2008 UN90)	55200	1.40441673	0.125733869	17.5446756	312.9991096	33.5642179	286.8584823
5686	(2008 UO90)	55200	2.19678461	0.432436105	5.7410168	100.7321651	221.0754604	164.644637
5687	(2008 UV91)	55200	2.20826583	0.616458817	19.5145036	78.0622639	15.9129234	107.7604094
5688	(2008 UW91)	55200	1.14640213	0.571653795	7.3151624	282.6663049	248.171702	269.6493281
5689	(2008 UX91)	54768	1.44413738	0.216009137	27.2123679	328.0774275	32.8525286	21.3967524
5690	(2008 UY91)	54767	2.17063757	0.654489388	32.9180241	266.6862292	213.8054581	340.3576621
5691	(2008 UZ91)	55200	1.55033788	0.265074101	17.6426224	134.2508158	215.7765903	247.9784444
5692	(2008 UA92)	54768	2.60322441	0.605393773	3.0524754	351.5575233	39.5474867	1.0036487
5693	(2008 UB92)	54769	1.53879	0.344043251	7.2637207	317.5462202	30.9252935	22.9322628
5694	(2008 UZ94)	55200	2.19064014	0.571804015	30.2085804	159.6051554	248.3242081	121.0845368
5695	(2008 UB95)	55200	0.98983385	0.268618152	3.2389585	253.4966057	22.0852242	160.8615249
5696	(2008 UC95)	55200	2.20906398	0.486338496	8.4203833	340.9853737	83.3423276	127.3849379
5697	(2008 UD95)	55200	1.1431554	0.136163083	4.3594175	107.6454583	223.2786379	39.3752852
5698	(2008 UT95)	55200	1.81448736	0.574753898	3.8118931	247.376393	220.1086138	154.7433814
5699	(2008 UU95)	55200	2.51773819	0.676904989	1.1717632	23.9695931	297.8350163	120.017203
5700	(2008 UT99)	55200	1.53952457	0.309083708	1.590376	116.4261401	261.5718244	233.15476
5701	(2008 UU99)	55200	2.33995983	0.537986558	4.2800506	349.8735612	44.0247845	119.4366255
5702	(2008 UV99)	54770	1.22678696	0.299843364	34.3029599	259.4781921	13.4572147	89.5997066
5703	(2008 UW99)	55200	2.46222849	0.617187252	1.4778519	345.4424696	21.3255242	115.8677521
5704	(2008 UP100)	55200	1.55015044	0.414907395	5.8514559	109.2860713	232.1390914	242.0126551
5705	(2008 UZ201)	55200	2.32789361	0.500162738	2.9853874	282.9049945	81.061262	130.5748759
5706	(2008 UA202)	55200	1.03319101	0.068519626	0.2642621	300.9268018	21.0221534	111.7919115
5707	(2008 UB202)	54772	2.4914331	0.485540987	6.5445124	160.7307022	223.7338187	3.7432132
5708	(2008 UC202)	55200	1.00867718	0.067986773	7.4734188	92.5661454	38.1726658	333.6644507
5709	(2008 UD202)	54772	1.87330576	0.40901268	5.6466667	118.3059012	234.9718152	18.8876239
5710	(2008 UE202)	55200	2.47522917	0.476968207	2.0255679	27.5937613	348.5107771	114.885359
5711	(2008 VC)	55200	1.12117669	0.172396317	5.721872	240.5259907	218.4141264	311.5721935
5712	(2008 VD)	54773	1.24127635	0.243238774	31.6750948	299.5395489	37.4566507	39.7953116
5713	(2008 VE)	55200	2.6966123	0.635612594	7.6305474	128.0580773	228.8683674	104.3229636

#	Object	Epoch	a	e	i	w	Node	M
5714	(2008 VF)	55200	0.90604828	0.325799962	26.1976506	3.2333967	234.4515343	301.337755
5715	(2008 VH)	54775	2.16804266	0.478754903	5.1836638	91.0327218	201.8275103	50.9700878
5716	(2008 VJ)	54775	1.70992809	0.467070431	25.9065232	83.2938201	227.5539031	40.2342531
5717	(2008 VK)	54774	1.57054219	0.447097825	29.0224744	121.2388578	218.4828097	24.2970806
5718	(2008 VL)	54772	2.42148999	0.617737366	2.6807647	143.4032274	216.6217001	7.9706124
5719	(2008 VM)	54773	1.34090393	0.396795017	4.1324929	69.1972137	42.009812	327.5779746
5720	(2008 VN)	55200	3.04689103	0.645266763	12.9168656	277.1262209	60.0555326	101.4050605
5721	(2008 VB1)	55200	1.2778222	0.27517687	10.3159403	136.8454705	50.418056	178.889104
5722	(2008 VU3)	55200	2.48586847	0.6198068	3.9323543	144.4818583	224.025163	113.8008596
5723	(2008 VY3)	55200	0.98936357	0.348424104	12.3766814	301.5122457	220.2738088	347.2220004
5724	(2008 VZ3)	55200	1.85528938	0.525899435	3.5329293	237.5281042	228.9593284	145.6506676
5725	(2008 VA4)	55200	1.28540685	0.21928556	11.4141961	197.8876441	220.8343505	277.54522
5726	(2008 VB4)	54776	2.35196836	0.617439272	0.0569656	171.3147103	189.3163588	8.7026237
5727	(2008 VQ4)	55200	1.74970722	0.332336528	11.58409	232.5150828	256.4542929	123.7611513
5728	(2008 VR4)	55200	0.92203653	0.387920755	4.1945564	235.3869353	37.0712224	198.8060362
5729	(2008 VS4)	54777	2.01920794	0.473153542	1.3445206	208.3245781	197.3687354	0.5844874
5730	(2008 VT4)	54777	1.43868565	0.118702789	21.9444503	125.8852429	224.2846879	41.3905355
5731	(2008 VU4)	55200	2.37807543	0.770735114	11.9947384	23.2118062	291.1399485	130.4455906
5732	(2008 VG14)	55200	2.81331821	0.557784646	10.0452079	112.8208003	260.2581932	96.7195134
5733	(2008 VH14)	55200	2.85085925	0.645624989	1.4297671	255.2468705	206.4826464	76.0568731
5734	(2008 VK14)	55200	1.54206751	0.505757313	6.9160581	29.9011555	308.2700798	243.9905248
5735	(2008 VL14)	55200	2.20833364	0.817316621	1.9492754	243.8449133	39.9996493	147.4649664
5736	(2008 VA15)	55200	1.45183147	0.304707575	1.8225175	96.4359249	335.3890969	225.5456135
5737	(2008 WB)	55200	1.38446182	0.094940133	44.2817202	164.6315767	236.9036103	258.6189195
5738	(2008 WC)	55200	1.74241998	0.458071606	2.2233749	219.0035287	238.9501371	161.6659738
5739	(2008 WD)	55200	2.42137624	0.615085089	2.2095198	225.2070853	231.9209818	99.3982858
5740	(2008 WE)	54789	2.29333327	0.55643689	1.0293775	340.120566	66.0925153	2.6018487
5741	(2008 WK)	55200	1.41722821	0.281574246	6.3396987	28.9860328	61.7899416	222.3314905
5742	(2008 WL)	55200	2.73011638	0.64326929	6.7009622	109.8454574	277.3104974	95.3178971
5743	(2008 WM)	54789	1.07365778	0.140852636	12.3191921	84.9233458	57.7332897	290.0347221
5744	(2008 WP1)	55200	2.22085037	0.43079887	7.5533371	330.7477613	71.4777366	123.7009565
5745	(2008 WQ1)	54791	2.6263651	0.599271744	34.7919271	160.0306334	230.5820651	4.4982074
5746	(2008 WN2)	55200	1.4179426	0.311862696	3.7454551	283.2181049	227.2190458	183.7688461
5747	(2008 WO2)	55200	1.02512642	0.188216219	2.0096568	85.6715834	238.1740354	101.7313232
5748	(2008 WP2)	55200	1.50350097	0.350147167	14.8759069	37.9600573	57.6703014	201.4486742
5749	(2008 WQ2)	55200	0.84642672	0.204701196	13.4699628	8.2786005	234.0093553	331.2070701
5750	(2008 WY13)	54795	2.41013389	0.735666693	15.633128	70.8121947	238.9952099	22.1183864
5751	(2008 WZ13)	55200	1.99876126	0.559831065	8.1428279	133.0651966	52.3104494	80.4556228
5752	(2008 WA14)	55200	1.26395463	0.428613399	13.0300014	84.3157441	71.678676	234.3820491
5753	(2008 WB14)	54792	2.45081645	0.579171338	8.457772	170.8420706	238.3936207	2.2784637
5754	(2008 WC14)	55200	3.21837595	0.655317142	21.0101257	16.0396112	55.618641	69.8498734
5755	(2008 WD14)	55200	2.23126596	0.562700271	5.6029191	167.4168238	235.88287	123.8301133
5756	(2008 WE14)	54791	1.63264143	0.388062096	13.9907442	324.1034388	59.0766828	14.8531637
5757	(2008 WF14)	55200	1.5399858	0.304199471	6.8599263	157.8313999	239.2081991	222.4151571
5758	(2008 WG14)	55200	1.65996368	0.487831363	4.469002	63.6604852	65.5316869	163.3444661
5759	(2008 WH14)	54791	1.3924092	0.256302756	6.573505	351.2480471	61.7738364	3.3423198
5760	(2008 WJ14)	54791	3.8248918	0.7266715	10.9794852	178.9563673	237.3255743	0.276318
5761	(2008 WK32)	55200	1.39601116	0.378838402	15.4550939	139.7871424	58.8536855	141.2016243
5762	(2008 WM32)	55200	2.2310471	0.581239476	39.0734623	302.8067886	66.8280167	137.341715
5763	(2008 WW32)	54794	2.1575195	0.49854487	10.3227424	15.5488805	42.1648482	356.8655822
5764	(2008 WX32)	55200	2.21835473	0.57697971	23.8659491	111.8927974	57.3719693	76.8763912
5765	(2008 WY32)	55200	1.17284177	0.616393614	8.620634	43.2747569	251.8364767	3.7403595
5766	(2008 WB59)	55200	1.04489455	0.187973156	25.6449547	188.7956145	60.5352137	196.8029319
5767	(2008 WH60)	55200	1.55926549	0.261695164	13.2636555	144.017405	257.5792929	214.4269209
5768	(2008 WJ60)	55200	1.59773092	0.291394146	16.6858521	169.8075317	259.5077047	203.874143
5769	(2008 WK60)	55200	0.77982184	0.320036732	8.4962718	146.3494356	81.4597654	66.057096
5770	(2008 WL60)	55200	2.40638176	0.553903276	18.0186335	95.8602617	56.0059771	83.4298561
5771	(2008 WK61)	54798	1.65776925	0.419223024	17.1469338	212.4823111	253.4999126	346.3220214
5772	(2008 WL61)	55200	2.25920562	0.524743244	7.4171726	293.522243	43.0232211	137.8873894
5773	(2008 WM61)	55200	1.47982623	0.332252293	2.6780863	198.4643377	240.4009153	214.0607403
5774	(2008 WS62)	54797	1.26892623	0.316675226	5.1501843	109.8003907	238.6148716	41.785655
5775	(2008 WT62)	55200	0.88405657	0.355733059	18.3843698	148.3269835	58.0218223	358.608063
5776	(2008 WQ63)	55200	1.73515524	0.606891297	0.9340003	228.1451905	317.9324422	137.5359295
5777	(2008 WL64)	55200	1.32597128	0.721959665	41.6264663	256.537142	45.8142034	303.3353783
5778	(2008 WM64)	55200	1.00495435	0.106951228	33.5270433	257.3660014	91.5244651	125.0563825

#	Object	Epoch	a	e	i	w	Node	M
5779	(2008 WY94)	55200	1.17681957	0.181440912	6.0555987	31.2519387	71.4347565	284.223922
5780	(2008 WZ94)	55200	1.52198737	0.774011981	6.5059746	320.6617124	249.1663264	164.7960242
5781	(2008 WE96)	55200	1.90167142	0.444692235	13.3377809	353.3442949	68.4034416	151.7058843
5782	(2008 WF96)	54801	2.4839132	0.580454783	1.8258376	135.3381655	266.9844389	5.5101124
5783	(2008 WG96)	55200	1.05009155	0.493402242	0.674303	49.6033282	263.2766784	62.9193771
5784	(2008 WH96)	54802	1.37118043	0.402987844	7.2701867	259.1283683	75.57004	48.27061
5785	(2008 WJ96)	54805	2.4018218	0.585697048	2.0018811	222.7248574	247.2729885	351.8737027
5786	(2008 WK96)	55200	1.7464624	0.499305503	8.2174259	310.9605157	66.6810655	187.8518686
5787	(2008 XB)	54801	1.48995953	0.313892197	1.2435139	139.1658519	287.876674	358.1860008
5788	(2008 XF)	54803	1.30687693	0.137840259	14.5637537	243.643762	238.8943772	315.5181084
5789	(2008 XG)	54803	1.42025757	0.236578763	24.8705975	18.056222	71.67512	348.652233
5790	(2008 XH)	54802	1.35158165	0.447714257	15.483547	265.6368503	65.6447251	47.5613817
5791	(2008 XK)	54802	2.4474126	0.635078308	5.715481	40.9472556	74.9425699	351.2641766
5792	(2008 XM)	55200	1.22203429	0.909025686	5.4602469	27.2004996	240.7925356	322.5933037
5793	(2008 XN)	55200	2.16277471	0.591770423	5.3303147	62.862336	98.4693327	96.1589017
5794	(2008 XO)	54805	2.04173701	0.498133326	5.2612759	158.5091464	240.6648318	10.0953088
5795	(2008 XP)	55200	1.95566455	0.353194996	10.6221753	30.5473478	75.486249	128.1038458
5796	(2008 XS)	55200	1.27681502	0.214776849	3.3126088	169.8957125	250.9938814	277.7589623
5797	(2008 XB1)	55200	1.33244835	0.372836781	12.6847559	83.9773074	270.4224804	289.2785301
5798	(2008 XC1)	55200	2.05285622	0.579041185	4.4792985	43.6120285	86.4361425	118.2153309
5799	(2008 XK1)	54808	1.32355227	0.160561767	17.8630358	225.7921367	251.8117342	329.8662588
5800	(2008 XL1)	54807	1.42138435	0.198005988	27.2205635	130.3308315	248.3815147	39.3386879
5801	(2008 XM1)	54807	2.34760772	0.786676308	5.0150143	267.0976568	268.7095194	346.1560252
5802	(2008 XA2)	55200	2.37649372	0.615254194	2.9386876	334.3910116	39.6745736	118.1137201
5803	(2008 XB2)	55200	1.15689554	0.37759915	2.4281913	258.9292935	270.5837483	259.4475736
5804	(2008 XC2)	54806	1.95900997	0.486796272	4.0399197	122.3740751	269.9303695	13.486339
5805	(2008 XE2)	55200	2.55211985	0.500734267	8.0013313	41.2919045	45.1643696	95.2801853
5806	(2008 XO2)	55200	1.68633222	0.316925506	9.4733223	196.8824379	39.1370483	21.4323372
5807	(2008 XP2)	55200	1.88832699	0.346736291	23.240506	0.8542651	58.7564387	167.3945762
5808	(2008 XQ2)	55200	2.20167993	0.550717261	14.4977344	354.8363312	34.6608666	137.0313496
5809	(2008 XU2)	55200	2.446913	0.621245759	2.966275	333.8951059	62.4464785	109.0033266
5810	(2008 XV2)	55200	2.17226328	0.419385221	26.471864	142.7295124	279.5638197	129.0684692
5811	(2008 XW2)	55200	1.06476972	0.443730952	26.4506159	259.8419849	71.8272087	49.90098
5812	(2008 XX2)	54807	2.56503061	0.542823481	12.5744436	145.8643594	305.6523413	359.0038048
5813	(2008 XE3)	55200	2.61113503	0.549656497	7.4758504	44.4524202	315.3265367	130.1834419
5814	(2008 YA)	55200	2.64808268	0.826857614	32.4943556	200.4727108	120.2759438	96.1017123
5815	(2008 YF)	55200	1.62794424	0.438304092	21.971733	321.0265396	87.0225309	196.5602979
5816	(2008 YJ2)	54822	1.79890774	0.527812209	24.5964317	71.6225389	76.2064972	340.1821962
5817	(2008 YK2)	55200	2.19352192	0.491335452	25.5071071	47.982202	93.8812992	99.9021811
5818	(2008 YL2)	54822	1.5880938	0.539306189	22.9282092	103.2267705	267.9587693	24.8031967
5819	(2008 YM2)	55200	2.33017167	0.551574342	4.8922517	171.664512	263.7065991	107.1580079
5820	(2008 YN2)	55200	1.03843909	0.220723879	3.4896984	263.9331444	88.5398997	63.2515041
5821	(2008 YO2)	54822	1.66358441	0.587228613	1.4180031	78.1322539	92.7985243	336.7230225
5822	(2008 YP2)	54823	1.53161807	0.325790081	6.928553	122.032944	268.8862196	30.0109224
5823	(2008 YQ2)	55200	1.03416171	0.255291541	23.2974847	98.9652752	91.8787554	284.1534065
5824	(2008 YR2)	55200	2.26244295	0.433938468	7.7893772	182.6553275	329.2015693	96.0366382
5825	(2008 YC3)	55200	1.01300086	0.045827479	12.0326042	79.8209809	91.6084211	288.5669619
5826	(2008 YD3)	54822	2.26834948	0.541539566	0.3030527	315.8015242	133.5526332	0.8067832
5827	(2008 YE3)	55200	1.54923453	0.286341873	19.3142177	340.9952184	87.4332583	209.4295151
5828	(2008 YF3)	55200	1.53811043	0.326678671	20.4631053	84.8999154	92.9893245	144.0352184
5829	(2008 YG3)	55200	2.59213747	0.566718269	10.497724	345.9123205	102.5976454	89.1099303
5830	(2008 YJ3)	55200	1.534042	0.475885621	25.6273374	237.2953087	105.6144896	241.5584857
5831	(2008 YG26)	55200	2.17505214	0.528336748	9.7256907	323.9562882	105.1595097	120.3784048
5832	(2008 YM27)	55200	1.67857307	0.461064077	17.7617044	125.6016624	276.1002452	187.7715878
5833	(2008 YN27)	55200	2.19275472	0.595692709	23.8938425	303.1979119	96.4428339	125.5178911
5834	(2008 YO27)	55200	1.55572602	0.254652288	41.3136921	305.4666089	100.5326922	218.259261
5835	(2008 YQ27)	55200	1.30503828	0.305824302	15.1664077	48.6438294	95.5030455	219.4367807
5836	(2008 YR27)	55200	2.25570504	0.751281566	8.2763305	149.9191983	91.2235063	71.5245768
5837	(2008 YS27)	55200	1.46769759	0.317329468	4.8758469	13.1113409	91.1178038	207.280836
5838	(2008 YZ28)	55200	2.49907405	0.620174784	35.3753942	131.1133356	266.5467577	102.3986229
5839	(2008 YA29)	55200	2.07186798	0.488995045	5.9490909	184.0122615	277.3077366	122.0581085
5840	(2008 YB29)	55200	2.37547909	0.579233023	3.9785225	170.1110294	283.1272832	100.8819479
5841	(2008 YC29)	54830	0.86192995	0.407525438	3.2473143	138.9395213	94.1251967	268.1447287
5842	(2008 YD29)	55200	2.87942234	0.5726179	15.4143787	21.2194697	90.959472	69.9107306
5843	(2008 YE29)	55200	2.80971605	0.617292225	6.221283	6.9644652	135.8543207	66.7864299

#	Object	Epoch	a	e	i	w	Node	M
5844	(2008 YF29)	55200	2.43578074	0.61548845	1.4569263	334.2548954	168.762525	86.6526401
5845	(2008 YG29)	55200	2.22844004	0.526465848	6.0226723	163.6679147	283.9460148	112.8722965
5846	(2008 YE30)	55200	2.36418666	0.732807285	14.1390519	288.5150949	285.8704848	79.9029823
5847	(2008 YF30)	54832	1.31064434	0.323192249	10.0045724	253.9491689	275.0925248	321.0375941
5848	(2008 YG30)	55200	1.78166999	0.504223092	7.8341229	226.9678002	284.846731	136.5656763
5849	(2008 YH30)	55200	1.69117082	0.47219191	5.4423606	309.6733956	98.7482753	183.1733906
5850	(2008 YT30)	55200	1.26947616	0.275216179	16.1435694	334.0613882	269.6460505	114.4681587
5851	(2008 YU30)	55200	2.48593341	0.581451387	5.9878815	350.2148098	92.6578264	96.7817658
5852	(2008 YU32)	54839	1.53897548	0.596062045	3.4080026	83.675499	232.9046161	43.1814776
5853	(2008 YV32)	55200	1.52944845	0.41377792	1.0940325	39.6955138	114.4843099	169.1284488
5854	(2008 YW32)	55200	2.3194794	0.55874576	0.9878418	2.3372577	71.1785881	109.5924363
5855	(2008 YX32)	55200	1.23284557	0.390901219	12.6562218	149.8020952	84.8192632	175.9306604
5856	(2008 YY32)	55200	2.08581614	0.55008336	6.0777367	211.9676764	284.2628643	111.4584081
5857	(2008 YZ32)	55200	1.03746859	0.620612864	16.5541228	224.3747716	105.2886172	59.1864546
5858	(2008 YC33)	54832	1.33503174	0.265676151	11.7683104	245.4830649	272.353291	323.4054644
5859	(2008 YV148)	55200	1.42920527	0.17258396	12.6004909	102.9256302	101.5700619	137.9772068
5860	(2009 AK)	55200	2.58692787	0.628997223	26.2310359	226.5275379	259.7233544	78.3241414
5861	(2009 AL)	55200	2.47655444	0.672523807	3.8182163	311.2758516	226.3524398	75.5763415
5862	(2009 AM)	55200	3.00329012	0.58409838	10.9862307	194.9815947	290.8480252	64.6402231
5863	(2009 AN)	55200	2.40574821	0.572895304	21.5057468	99.4441823	293.8186817	117.6380872
5864	(2009 AS)	55200	2.28661367	0.474749366	5.6869428	78.7404751	111.1065217	100.2750338
5865	(2009 AT)	55200	4.26190024	0.716340221	11.9250093	123.9452074	306.781058	44.6379501
5866	(2009 AU)	54834	1.51082475	0.241085689	33.238791	57.0070215	285.7503333	95.4081409
5867	(2009 AV)	55200	1.0298768	0.073948585	45.8660353	322.1800892	150.7656874	26.4543359
5868	(2009 AK15)	55200	1.30989364	0.428710756	13.8149546	6.367158	186.8716754	198.1113955
5869	(2009 AL15)	55200	1.30128755	0.159688286	16.5216785	265.6560063	114.6022746	313.2337824
5870	(2009 AM15)	55200	0.81249521	0.487117493	28.8623264	131.4642064	166.2232577	274.1794411
5871	(2009 AC16)	54849	1.52360593	0.537128664	18.3446422	99.7590075	106.8776416	326.9323269
5872	(2009 AD16)	55200	2.62098728	0.595941093	15.2240551	195.7566077	299.9863868	77.6696486
5873	(2009 AE16)	54849	1.79329462	0.737814679	46.152371	280.3607897	309.9859957	338.9065256
5874	(2009 AF16)	55200	2.18770587	0.459558518	14.7407692	180.6705373	304.5461839	103.7417318
5875	(2009 AG16)	55200	1.54806433	0.624598907	28.0425586	257.7686114	110.7078375	217.9025389
5876	(2009 AH16)	55200	1.96864798	0.758679279	21.9416147	329.4088267	54.5715571	147.3556786
5877	(2009 BB)	55200	2.418984	0.845693635	18.6733456	154.7135153	72.538584	74.1806722
5878	(2009 BC)	54850	1.08260675	0.542740112	8.6108055	134.6513762	117.546032	284.5204959
5879	(2009 BD)	55200	1.00861521	0.040820957	0.3853003	110.4707321	58.5289633	294.2876531
5880	(2009 BE)	55200	1.48091281	0.448432319	0.9440665	61.3260372	125.6027664	164.4282225
5881	(2009 BF)	55200	1.82648928	0.307524323	51.6098191	347.1249718	296.0110393	347.092407
5882	(2009 BG)	55200	1.10553167	0.272927234	5.5581632	93.1292645	300.0995053	352.5722609
5883	(2009 BD2)	55200	2.59121629	0.507804106	14.6530965	262.2035781	166.7139738	106.9850461
5884	(2009 BE2)	55200	1.55949262	0.353390672	23.4209875	138.1424959	91.1632582	66.0894603
5885	(2009 BF2)	55200	1.0624391	0.184370677	4.5524791	95.7574315	301.241606	17.0017701
5886	(2009 BG2)	54849	2.47085021	0.771240127	11.4997689	183.3112338	357.6213784	351.1966681
5887	(2009 BH2)	55200	0.8139335	0.475878041	23.1909997	220.9106503	117.1493406	207.1537294
5888	(2009 BJ2)	55200	0.94653201	0.278927784	6.5015281	300.0111382	296.19415	288.3871078
5889	(2009 BK2)	55200	1.01258437	0.213016738	3.5729406	121.3537803	126.5844583	230.0306248
5890	(2009 BL2)	55200	2.50269053	0.586474831	7.3190457	52.9646028	150.9265447	61.7846206
5891	(2009 BM2)	55200	2.73072023	0.56667936	25.0132814	9.9896386	126.9396337	73.0792326
5892	(2009 BN2)	54852	1.78959577	0.498540443	4.1510705	131.2269018	302.0345014	15.9411054
5893	(2009 BW2)	55200	1.01872406	0.139647113	1.0118491	193.1830328	26.3048718	250.7871825
5894	(2009 BO5)	55200	1.42192899	0.326155893	3.4611845	212.3531343	306.101924	183.817053
5895	(2009 BP5)	54856	2.14554384	0.689914788	4.9573811	99.1560899	116.8349481	343.0344781
5896	(2009 BQ5)	54855	1.24498369	0.657433281	11.7539784	45.7612811	310.9045165	46.2622801
5897	(2009 BR5)	54856	2.02536595	0.658802883	3.834354	277.2829262	300.8571134	340.3106796
5898	(2009 BS5)	55200	1.58569904	0.386738287	1.6235884	151.294948	306.6234043	181.5046964
5899	(2009 BT5)	55200	1.32352591	0.129118384	21.2153264	73.2704618	130.5523793	163.8990395
5900	(2009 BU5)	54856	1.65847526	0.677927812	4.6151993	337.6093194	37.943034	26.8117495
5901	(2009 BA11)	54861	1.92365581	0.483105419	4.3940736	212.6335714	316.8409095	347.5591296
5902	(2009 BB11)	55200	1.37469907	0.148189634	19.4740938	293.4772115	121.3485429	281.219887
5903	(2009 BC11)	54859	2.29840768	0.600712459	3.2267469	88.2834814	93.7777924	349.4611131
5904	(2009 BD11)	54857	2.65057838	0.602108621	11.7088779	7.1350189	123.5409534	359.0008114
5905	(2009 BG11)	55200	1.12359024	0.204255342	22.9647455	256.4172712	300.9911666	231.5164256
5906	(2009 BH11)	55200	2.4105325	0.642661971	0.4436152	280.0025025	156.7075705	99.4717516
5907	(2009 BC58)	55200	2.30187798	0.484240708	1.8574165	72.1466609	331.9231526	140.1517852
5908	(2009 BD58)	55200	1.6999507	0.476355646	15.5806604	64.9217005	128.4857895	127.5965337

#	Object	Epoch	a	e	i	w	Node	M
5909	(2009 BE58)	55200	0.93741602	0.560773563	1.8596265	121.0847212	149.3613665	293.4398037
5910	(2009 BF58)	55200	1.51108586	0.377021628	0.9833231	144.9400278	303.3972509	198.4999428
5911	(2009 BG58)	55200	2.03659833	0.511299735	5.0012372	349.3379632	125.13821	119.5633569
5912	(2009 BH58)	55200	2.01298211	0.505215422	3.6951383	351.3935363	147.1402014	115.2407647
5913	(2009 BJ58)	55200	1.85110501	0.711688818	13.0313252	85.3742856	131.6841277	107.7127767
5914	(2009 BK58)	55200	2.54533635	0.622542424	2.5910914	15.2633275	139.1402783	77.5978413
5915	(2009 BL58)	55200	1.68879812	0.467591774	5.4543823	228.4793125	320.0191452	131.1041248
5916	(2009 BM58)	55200	2.53965865	0.588471894	6.0528687	155.5503865	319.6805629	85.8629489
5917	(2009 BN58)	54862	1.36699585	0.246946616	6.7029147	194.2929249	313.6008753	350.8571485
5918	(2009 BO58)	55200	0.83634861	0.449802298	26.2433469	207.6709557	130.7478106	202.7831323
5919	(2009 BP58)	55200	1.44480309	0.55507406	12.5781612	193.9259802	83.6577706	116.3158325
5920	(2009 BA71)	55200	1.63958446	0.2570495	3.8508351	28.9595852	131.2673824	144.0108883
5921	(2009 BK71)	55200	1.82208218	0.377653622	36.2950522	105.8638849	318.2303209	164.9130921
5922	(2009 BL71)	55200	0.9351157	0.264582206	5.6063603	292.3249063	17.5032951	189.1943947
5923	(2009 BD77)	55200	1.05476945	0.220117153	17.4656593	63.3824008	337.997969	19.6050644
5924	(2009 BE77)	55200	2.53139911	0.822395737	21.198395	26.6110225	201.4438559	66.2862922
5925	(2009 BD81)	54870	2.59348542	0.639521067	12.4657969	190.5356486	344.379139	352.5860966
5926	(2009 BE81)	55200	1.52241295	0.349474917	18.7932611	333.3836326	118.0722172	191.8317777
5927	(2009 BF81)	55200	2.05838358	0.549479741	8.5548264	328.2880659	120.7170711	123.6598475
5928	(2009 BG81)	55200	1.79401499	0.459970262	3.0794275	28.9030058	128.6293469	129.7622455
5929	(2009 BH81)	55200	1.63182648	0.274839535	45.1373278	78.4313766	154.3267937	111.8645634
5930	(2009 BJ81)	55200	1.85244681	0.455065027	5.840924	90.0332062	108.9055751	118.3381497
5931	(2009 CD)	54864	0.9003768	0.263049083	22.5657017	333.7168074	305.0996955	223.7370121
5932	(2009 CE)	55200	0.89486858	0.189809102	8.1062021	190.4440332	127.7902024	202.2779288
5933	(2009 CF)	54864	2.01655884	0.509451799	29.4429235	236.2482661	309.6434578	343.663455
5934	(2009 CG)	55200	1.40858686	0.300935916	18.1653018	307.1585205	140.3205066	223.5353068
5935	(2009 CP)	55200	2.17843248	0.551842135	7.9772774	26.8615917	135.4750683	95.5726619
5936	(2009 CQ)	54865	1.39502936	0.382407528	5.7173884	288.8141367	137.3832277	31.6336094
5937	(2009 CR)	54865	1.71637263	0.375544711	3.1871146	332.667584	145.4642756	6.2533552
5938	(2009 CS)	55200	2.00758703	0.595303653	3.1952414	170.5449564	250.1622354	137.7063569
5939	(2009 CT)	55200	1.85049037	0.638277336	3.8313831	337.5670516	275.86366	101.6145341
5940	(2009 CV)	55200	1.11240211	0.149646249	0.9566238	178.913461	24.1140165	227.9054134
5941	(2009 CZ)	55200	2.27924025	0.716250603	21.9632876	188.9448295	46.6249459	69.7862441
5942	(2009 CQ1)	55200	2.03305809	0.484308191	6.6642376	109.3656836	71.780721	95.7150263
5943	(2009 CR1)	55200	1.71309199	0.408149454	4.5443353	236.0432118	300.9683789	129.3595725
5944	(2009 CS1)	55200	1.34464403	0.328320099	14.8861084	254.9430803	332.6061341	151.7924559
5945	(2009 CT1)	55200	2.1238703	0.504968915	3.4306362	46.914359	131.4909718	93.6599144
5946	(2009 CU1)	55200	2.25121925	0.467965609	4.6591322	355.8345635	159.7983946	91.1394557
5947	(2009 CV1)	54866	1.8172165	0.528489023	8.2891624	293.9321619	137.5912209	19.4775503
5948	(2009 CW1)	55200	2.2951554	0.489343193	14.221389	144.175167	343.6665015	97.461138
5949	(2009 CX1)	54866	2.8091248	0.57909694	1.5868365	277.2778896	194.5266521	5.5732664
5950	(2009 CY1)	54866	1.42412178	0.137620867	19.6233856	346.0912925	140.1511469	7.8506746
5951	(2009 CZ1)	54866	2.24805716	0.659428905	2.1990601	66.2354073	150.357177	344.0038824
5952	(2009 CA2)	55200	1.50654793	0.479635838	31.7396137	22.653102	42.9366139	209.9646831
5953	(2009 CC2)	54866	1.89406516	0.676938865	2.6376839	275.013184	132.3477099	18.0053656
5954	(2009 CD2)	54867	1.99867131	0.513753908	3.4795195	216.4760997	315.4785713	350.1041396
5955	(2009 CR2)	55200	3.07150974	0.640337832	31.2811651	189.833263	32.3307529	37.7553484
5956	(2009 CX2)	55200	2.40757127	0.613567989	3.7616974	89.9377757	7.2596408	96.1540324
5957	(2009 CZ2)	55200	2.40509945	0.694666855	16.6606454	89.8101875	341.4358642	95.2614185
5958	(2009 CA3)	55200	1.64178046	0.542865423	9.2052769	140.9731699	265.1485839	182.2782393
5959	(2009 CB3)	55200	1.06461383	0.72356683	21.5292503	229.3888639	158.8381142	343.8010968
5960	(2009 CC3)	55200	2.20459774	0.534724992	11.3483154	15.3460086	194.9616103	83.1269041
5961	(2009 CR4)	55200	1.75394576	0.418680472	4.7846436	243.4808685	324.8467682	108.6902975
5962	(2009 CN5)	55200	1.54463955	0.465318271	11.9147775	53.0779863	349.8388017	206.3220082
5963	(2009 CO5)	55200	1.6571694	0.344768961	4.2340376	171.6022189	344.4890223	142.8275726
5964	(2009 CP5)	55200	1.22555181	0.314397783	13.1129728	268.3569123	330.3355451	173.4862458
5965	(2009 CQ5)	55200	0.93268036	0.091568673	18.6837782	118.164425	278.7351265	39.3018511
5966	(2009 CR5)	55200	1.07602594	0.262363746	5.0551053	321.1320175	316.8608257	169.8094356
5967	(2009 CS5)	55200	1.47436727	0.657304427	30.0697983	316.5868428	320.5819164	110.1518964
5968	(2009 CT5)	55200	1.98719934	0.860061974	10.0222056	199.2850376	163.2457122	130.464212
5969	(2009 CV5)	55200	1.98413695	0.494732104	1.3560259	175.3776905	355.722235	106.3411276
5970	(2009 DD)	55200	2.03256922	0.496720565	5.7640387	1.6508025	149.2323371	108.5589952
5971	(2009 DV)	54882	1.92067592	0.724606935	4.1217168	76.023841	333.801888	19.2891701
5972	(2009 DW)	55200	1.89374631	0.465961542	2.8553312	8.9991047	144.0477408	120.0563253
5973	(2009 DX)	54881	2.42340732	0.574917109	14.6811266	21.0504268	150.4204755	355.6112712

#	Object	Epoch	a	e	i	w	Node	M
5974	(2009 DZ)	55200	1.45185189	0.301472997	14.1130064	335.6811883	151.5407329	188.9012697
5975	(2009 DA1)	54885	2.5485947	0.701853114	5.862332	272.6832161	156.4278533	15.4309554
5976	(2009 DB1)	55200	1.2299643	0.439732224	4.4240827	239.7759101	168.0785043	280.1168001
5977	(2009 DC1)	55200	0.87332368	0.276311271	8.7868256	34.8524554	329.6818234	151.2785944
5978	(2009 DD1)	55200	1.24185715	0.080825394	29.3915244	104.9387952	158.3284824	123.0572792
5979	(2009 DE1)	54883	1.73263009	0.611244395	0.9453616	82.4393449	157.34573	337.3980134
5980	(2009 DF1)	55200	1.97987711	0.406523775	4.0636106	38.3782958	142.3250045	104.0295526
5981	(2009 DL1)	55200	2.24132577	0.465321209	3.5839071	224.7662332	353.0940239	74.4889676
5982	(2009 DM1)	55200	2.89671799	0.639223839	15.1988421	219.7247756	197.62199	70.055877
5983	(2009 DN1)	55200	1.44232796	0.285519012	7.8570885	314.1165153	280.9788396	124.582832
5984	(2009 DO1)	55200	1.95848447	0.459184197	6.8376484	356.4849786	156.5706293	115.0311463
5985	(2009 DR3)	55200	1.97557481	0.560309024	4.0862559	237.3507984	344.8719949	92.2734875
5986	(2009 DN4)	55200	1.22868088	0.239851249	3.0913355	53.0850696	151.6580956	195.3541735
5987	(2009 DO4)	54884	2.68400463	0.574627002	38.0212773	205.6874434	334.1950054	353.8771315
5988	(2009 DP4)	54885	1.64363761	0.434969162	19.2587653	119.6605311	340.08789	22.8760941
5989	(2009 DQ4)	55200	1.56750651	0.385768759	16.8686172	297.7572793	165.1922308	181.4025459
5990	(2009 DG9)	55200	2.9533537	0.581307692	21.1779158	38.4601561	140.9329678	56.1839561
5991	(2009 DS10)	55200	2.20952261	0.588535189	7.5020395	123.2369134	313.2722121	109.1913126
5992	(2009 DT10)	55200	2.08008082	0.620968062	3.9607128	132.6865156	309.6650716	120.4730242
5993	(2009 DU10)	55200	1.48466043	0.34690728	10.4047701	206.5186131	334.9970204	158.9505896
5994	(2009 DB12)	55200	1.17145572	0.565514087	26.8788388	232.9074407	149.4452503	306.036851
5995	(2009 DC12)	55200	1.33138277	0.256611102	2.9066498	275.5234665	345.4772966	124.8521446
5996	(2009 DR36)	55200	1.69642969	0.440523836	17.543046	104.3912907	359.1825839	163.8436318
5997	(2009 DS36)	55200	1.37141003	0.250565358	17.86236	163.5068169	337.2072677	201.5879582
5998	(2009 DH39)	55200	1.84915137	0.599158856	53.7215148	68.2859316	155.5009529	101.3448212
5999	(2009 DM40)	54888	1.33360317	0.344055865	6.8424716	305.322768	153.5243153	29.6319511
6000	(2009 DV42)	55200	1.61479771	0.275327444	19.9271153	343.7119807	117.0676964	195.4014098
6001	(2009 DZ42)	55200	2.44504815	0.583145071	13.1088699	183.5044918	295.1919744	85.1152221
6002	(2009 DA43)	55200	1.01593417	0.118613673	6.7033149	215.1065768	157.9762948	76.6012516
6003	(2009 DB43)	55200	1.1023736	0.172123971	0.9343248	38.5301603	43.777436	322.1280881
6004	(2009 DC43)	55200	1.80025366	0.489682878	20.8306277	172.6613825	84.3084571	98.3266672
6005	(2009 DS43)	54890	1.23782132	0.458816785	28.6471693	94.5865494	159.0917977	317.528721
6006	(2009 DT43)	55200	2.55738308	0.665403573	4.5902637	129.88825	339.4238136	83.0924909
6007	(2009 DV43)	54892	2.20131511	0.651525784	4.4197342	79.9207838	155.7518992	344.9015269
6008	(2009 DA45)	55200	2.25021724	0.433140572	1.2397631	29.5182747	131.6795657	89.9082315
6009	(2009 DB45)	55200	2.12035313	0.449406468	20.5379635	280.7827787	315.2178483	49.5791968
6010	(2009 DC45)	54890	1.41179081	0.369630626	3.5059474	300.4490625	161.6601735	26.9103519
6011	(2009 DD45)	55200	1.24090332	0.204924289	13.7451343	13.8841884	161.9620062	210.2143438
6012	(2009 DM45)	55200	1.17207293	0.367119386	26.6853153	90.8340564	336.3939917	291.1475576
6013	(2009 DN45)	54892	1.94997911	0.474748383	8.5317046	174.3808805	350.416136	358.7774206
6014	(2009 DJ46)	55200	1.27003768	0.320916032	18.9341066	111.5870333	340.6145971	250.4183765
6015	(2009 DK46)	55200	2.62629547	0.511823016	26.3310249	261.5643148	173.9882731	109.7420669
6016	(2009 DL46)	55200	1.45605497	0.305381503	7.9194464	159.7192228	63.5292124	141.7224851
6017	(2009 DE47)	55200	1.09565974	0.275650802	20.0618671	41.8003052	29.8832439	340.6833769
6018	(2009 DO111)	55200	1.04932067	0.279772482	2.9865091	273.069124	2.2598723	202.0551008
6019	(2009 EA)	55200	2.16171143	0.539787645	8.5608402	17.5415596	162.8375543	90.6946102
6020	(2009 EC)	55200	1.76769578	0.364396292	37.682623	225.924554	28.6965659	92.6681985
6021	(2009 ED)	54892	1.14385016	0.397961191	30.6034126	182.8558686	167.0242789	162.4936467
6022	(2009 EP)	54893	1.95276774	0.554656947	2.1996955	173.4861583	44.5530957	344.6730175
6023	(2009 EQ)	54893	2.51858271	0.569842102	50.3906051	54.2754401	336.8209477	49.1937297
6024	(2009 ER)	54894	1.89016133	0.46849882	4.4412156	154.0489339	350.1340289	6.0255773
6025	(2009 ES)	55200	1.43466805	0.329791418	30.337682	311.1806012	343.7792657	65.8413663
6026	(2009 ET)	54893	1.44560842	0.304337114	3.1804761	28.8068452	153.5193902	349.6158851
6027	(2009 EU)	54894	1.91115672	0.519354313	4.388902	221.0846914	349.9744482	345.8650033
6028	(2009 EV)	54897	1.72949624	0.523718439	17.018793	250.0899812	138.7345731	71.7472838
6029	(2009 EW)	55200	1.25735647	0.389080126	10.716172	258.1492908	345.9619118	174.094263
6030	(2009 EX)	54893	1.67375475	0.400254274	7.3697233	98.4919497	357.6781104	28.7342614
6031	(2009 EY)	54893	1.83937207	0.522542632	1.3193163	102.4509112	2.8968581	17.0599623
6032	(2009 EZ)	55200	2.33455813	0.514539338	18.689928	232.306338	348.8207023	68.5724258
6033	(2009 EA1)	54893	1.62442558	0.345270884	8.9381352	18.7294708	153.7974498	355.1127993
6034	(2009 EB1)	54893	1.1066291	0.448266025	12.1482358	186.7083885	151.1189016	194.5697983
6035	(2009 EC1)	55200	1.83891942	0.457830064	11.9796034	126.8552479	3.2989706	132.3785982
6036	(2009 ED1)	55200	2.00721565	0.405892985	29.7413338	2.356989	173.9564216	106.4766017
6037	(2009 EE1)	54898	2.30840065	0.537163547	0.6068788	167.8406604	1.494454	359.5972202
6038	(2009 EF1)	54894	1.37839366	0.373061868	12.5365086	108.8619449	350.1344395	31.4348633

#	Object	Epoch	a	e	i	w	Node	M
6039	(2009 EH1)	55200	1.17374622	0.35023876	0.9880722	94.6519286	156.7813499	188.0294404
6040	(2009 EJ1)	54893	1.5971502	0.474091526	0.0250496	148.7360995	312.348866	22.0519695
6041	(2009 EK1)	55200	1.2418036	0.22963741	9.1119089	21.6726458	358.514926	342.9001565
6042	(2009 EM1)	54897	2.53854669	0.570082663	18.3771946	185.3249523	347.9629456	358.424214
6043	(2009 EN2)	55200	1.6574484	0.524937738	47.3323678	138.1096997	144.8611881	110.150033
6044	(2009 EO2)	55200	1.71092727	0.481109102	11.4994528	220.3760345	264.8515415	145.8871761
6045	(2009 EP2)	55200	0.92697934	0.356305011	27.7169608	129.8159423	175.2100716	231.481343
6046	(2009 EQ2)	55200	2.42120992	0.495842663	6.5090837	40.0224112	175.1246935	67.19718
6047	(2009 EF3)	55200	1.04888253	0.305899957	16.5469334	210.9082438	177.6524622	34.5805183
6048	(2009 EG3)	55200	1.35383045	0.542999055	22.5574749	109.6614954	175.457618	127.8268919
6049	(2009 EH3)	54908	1.99938605	0.615046722	6.2396489	297.1465202	159.6256031	19.7139413
6050	(2009 FA)	55200	2.61911705	0.551331231	42.3496357	199.892049	3.5087937	59.9613678
6051	(2009 FD)	55200	1.16322043	0.492833185	3.1474686	281.3165498	9.5669027	175.6826571
6052	(2009 FE)	55200	2.53934892	0.607322352	1.933271	200.5774137	40.4213991	58.0494583
6053	(2009 FF)	55200	1.47317516	0.467972922	0.9843084	10.7060727	266.1289803	111.726055
6054	(2009 FG)	54911	1.96556607	0.529386967	0.0343297	81.9741936	42.6679313	16.2849106
6055	(2009 FH)	55200	1.47567146	0.339340615	0.6869827	24.1080434	176.5374263	149.5432852
6056	(2009 FJ)	55200	2.20345565	0.567750416	0.8921015	150.623291	353.655728	95.7796338
6057	(2009 FK)	55200	1.52257828	0.369902758	2.8199601	210.3272018	359.7698233	138.6975541
6058	(2009 FL)	54908	0.97995015	0.466053172	26.1039817	124.5621696	174.6359526	290.9862626
6059	(2009 FP)	55200	1.89078689	0.536279039	6.133715	126.2549306	343.3891073	130.6564557
6060	(2009 FQ)	54909	1.83720139	0.441342867	6.7193989	168.8169661	354.7523606	5.0983341
6061	(2009 FR)	54910	2.09910707	0.524192267	1.5050291	336.668316	183.896991	5.1599885
6062	(2009 FS)	54909	2.44570472	0.620293555	4.7254475	44.2021237	173.7677363	351.6591219
6063	(2009 FT)	55200	1.57129446	0.723891197	14.591596	220.4629016	90.8198324	102.9285329
6064	(2009 FG1)	55200	1.19448696	0.271510351	69.8610618	11.6472864	5.0369393	8.9798194
6065	(2009 FJ1)	55200	1.13762535	0.219024017	18.8581216	86.2289489	4.3140616	300.7429105
6066	(2009 FS4)	55200	2.46738604	0.583544182	0.6036412	208.0055848	356.083916	67.9726549
6067	(2009 FT4)	55200	2.67190187	0.548351225	15.2091374	325.2265049	162.6292521	73.5136484
6068	(2009 FU4)	55200	2.37771561	0.617799462	12.9341001	233.0159008	42.2867684	42.5196541
6069	(2009 FV4)	55200	1.7789138	0.588344245	45.8952507	135.5579423	173.5440757	51.4859728
6070	(2009 FW4)	55200	1.8594547	0.567607209	3.2664541	111.0138822	3.6153559	130.2222875
6071	(2009 FX4)	55200	1.28371012	0.32028041	0.5139846	194.9316109	50.4376873	161.0193151
6072	(2009 FY4)	55200	1.01220867	0.327382103	20.9725449	244.5439386	162.6695471	24.0703666
6073	(2009 FZ4)	54910	1.31263195	0.418406099	3.3282145	275.5697109	357.2708322	313.3924004
6074	(2009 FA5)	55200	2.32024433	0.558577717	2.7126177	203.4227589	355.0838951	76.336517
6075	(2009 FB5)	54910	1.96441616	0.422246948	1.8357843	139.7355546	41.7183624	1.9966793
6076	(2009 FX10)	54912	1.19897929	0.296483578	1.9297382	204.8791623	55.5168221	311.1634681
6077	(2009 FY10)	55200	1.23957416	0.554590162	42.226503	326.0737802	345.2065764	111.3255032
6078	(2009 FZ10)	54913	2.13248587	0.597424268	6.457398	304.4149636	177.8269665	14.0564291
6079	(2009 FE19)	55200	1.24542641	0.195407905	12.3958836	218.2231556	1.4328811	178.5449088
6080	(2009 FF19)	55200	1.21299955	0.409446466	0.553592	245.4308958	84.2753907	103.3534418
6081	(2009 FG19)	55200	2.90873754	0.720786866	54.5238078	120.4600588	187.5493435	25.0144366
6082	(2009 FS23)	54916	2.03319529	0.481794267	10.7160767	354.0493029	182.88877	2.6835136
6083	(2009 FT23)	55200	1.19762128	0.445028088	11.5045382	98.4317419	181.8327907	169.3244804
6084	(2009 FU23)	55200	0.83711913	0.282036903	13.8999002	315.11279	57.8300895	172.1859218
6085	(2009 FV23)	55200	1.75894036	0.421065555	7.7039929	178.8858815	9.4804797	118.8464219
6086	(2009 FL25)	55200	2.20485848	0.746907296	11.9556021	17.2539522	65.8220158	103.5859325
6087	(2009 FW25)	55200	0.8824267	0.320008535	12.2975507	323.6819467	0.251652	221.6263528
6088	(2009 FN28)	55200	2.63684703	0.519119763	31.1659197	52.2694849	175.2764595	60.5631787
6089	(2009 FO28)	54922	2.29988517	0.616315853	20.1201898	69.357789	188.6383517	345.1509836
6090	(2009 FP28)	55200	2.00591137	0.548685165	8.2096645	353.5902486	256.2030789	79.0472339
6091	(2009 FP29)	55200	1.63460609	0.333878971	1.7657711	333.7555833	195.4681973	139.8961965
6092	(2009 FY29)	55200	1.6898567	0.379290785	21.662355	91.0920854	185.0086629	89.7281309
6093	(2009 FJ30)	55200	2.23664249	0.612075994	1.7299871	39.8093229	226.9012547	64.1982249
6094	(2009 FR30)	55200	1.93162331	0.379456371	12.7256682	114.5098258	16.9352844	136.6024699
6095	(2009 FU30)	55200	2.39179429	0.595773514	0.8446885	107.3711389	113.7780141	67.871647
6096	(2009 FN32)	55200	2.35046004	0.499709215	29.318301	16.5328292	189.0011094	73.4984772
6097	(2009 FO32)	55200	1.34866868	0.508019332	4.3306344	277.1194607	3.9317366	140.8047399
6098	(2009 FP32)	54920	1.9509313	0.593451686	0.8714722	236.4499353	18.1068115	343.9542379
6099	(2009 FQ32)	54920	1.22517741	0.188614509	6.1439071	203.4691739	7.7667272	344.9470677
6100	(2009 FR32)	54920	1.79037612	0.406522993	3.7720605	200.2935007	0.5887031	355.0926305
6101	(2009 FS32)	55200	1.05153242	0.063663113	14.3987241	281.0366379	7.0285836	163.8388698
6102	(2009 FT32)	54923	2.64523397	0.629563616	8.6202443	62.7409097	180.3130076	350.261626
6103	(2009 FF44)	55200	2.34690956	0.478833329	1.8806555	127.9135377	63.465369	76.4046019

#	Object	Epoch	a	e	i	w	Node	M
6104	(2009 FG44)	54922	0.96499629	0.113475787	31.7298207	15.8894127	6.7149573	165.2847273
6105	(2009 FH44)	55200	1.44056655	0.362079924	12.5327942	295.1328935	195.3577334	188.1114589
6106	(2009 HB)	55200	2.43076461	0.593129637	10.0352145	106.8753214	207.4627161	28.7613599
6107	(2009 HC)	55200	1.03924824	0.125623658	3.7780197	269.8312392	203.8350463	322.866011
6108	(2009 HD)	54943	2.43438434	0.557032898	12.4205416	172.3723442	35.0318052	0.8520422
6109	(2009 HE)	54942	1.29619051	0.399807229	44.208661	118.2859428	200.9331498	297.9482096
6110	(2009 HF)	54940	1.56551702	0.424149607	18.1240748	111.3539323	29.3510904	29.5758843
6111	(2009 HG)	55200	1.36735408	0.223830808	3.6373839	356.270244	231.1524907	148.8011731
6112	(2009 HR2)	54941	1.63639608	0.548125041	10.2214523	95.7258837	27.9085976	28.2155508
6113	(2009 HS2)	54940	3.00640965	0.853753832	17.1640094	54.7534761	30.906418	13.9722732
6114	(2009 HT2)	54940	2.6920984	0.60778458	8.6722458	178.660418	29.4118047	0.1430831
6115	(2009 HU2)	55200	1.60070716	0.322193711	16.7036024	166.417918	185.3347121	356.8874878
6116	(2009 HV2)	55200	1.64070633	0.499372057	6.726327	260.7767172	38.165918	84.3398665
6117	(2009 HW2)	54942	2.21155895	0.523441818	2.8704959	350.2545042	211.6610254	3.0707321
6118	(2009 HA21)	54943	1.45967244	0.728228975	6.4014597	219.7806138	205.5348256	61.2798923
6119	(2009 HB21)	54943	1.74237221	0.423226485	39.7189333	317.3320753	206.8759676	17.9341954
6120	(2009 HC21)	55200	1.16829732	0.157085166	19.3514097	126.8541878	213.3423563	86.4171319
6121	(2009 HD21)	55200	2.764221	0.690468333	18.6506493	134.208531	179.3286595	28.0682786
6122	(2009 HE21)	54942	2.39126898	0.854648194	6.462725	298.5082227	34.5374215	345.8219563
6123	(2009 HF21)	55200	2.34359626	0.567304149	4.2670086	188.6688301	34.7920652	68.065927
6124	(2009 HG21)	55200	0.90803931	0.367629727	5.43508	316.9034045	32.5343258	190.0377733
6125	(2009 HH21)	55200	1.40438195	0.264228155	4.2233357	11.3794617	213.4574997	145.1322432
6126	(2009 HJ21)	55200	1.62231409	0.646197312	3.0224378	277.7461938	30.6473905	98.0670875
6127	(2009 HL21)	55200	1.66347145	0.4445636	1.0057328	9.3327192	144.3463226	140.194753
6128	(2009 HJ36)	54943	1.57712295	0.356996849	3.8524211	202.7363082	34.2483817	348.7026823
6129	(2009 HS44)	55200	2.57019559	0.702916752	2.4417272	73.0181467	209.3672758	50.5027385
6130	(2009 HU44)	55200	0.83013781	0.644206753	6.6455787	213.4538968	213.0339712	56.3902888
6131	(2009 HV44)	55200	1.6644099	0.422955707	37.9936727	76.8348168	217.2145104	84.2463242
6132	(2009 HW44)	55200	2.68272877	0.595837421	41.0492899	296.5041685	38.0517885	10.6766754
6133	(2009 HX51)	55200	1.50574432	0.385912084	12.4028543	59.1575701	63.9603021	180.5622249
6134	(2009 HY51)	55200	1.71081962	0.306390686	13.6337955	81.3159109	62.5164694	155.9193858
6135	(2009 HT58)	54946	1.34547711	0.212071126	17.9144649	189.9772285	34.0897283	353.6165403
6136	(2009 HU58)	55200	2.06907749	0.910027332	35.7660644	285.2788833	62.9948423	64.7137441
6137	(2009 HV58)	55200	1.98274978	0.583461398	47.001199	50.9261866	69.8126471	123.6223612
6138	(2009 HE60)	55200	0.99767016	0.265038525	1.5761543	220.1224987	229.4855214	347.8872304
6139	(2009 HG60)	55200	1.98396527	0.644790355	6.9503586	283.4571279	212.9702572	106.1288191
6140	(2009 HV67)	55200	2.69510222	0.667020849	30.6072664	80.3533214	199.7270161	41.961751
6141	(2009 HW67)	54949	2.0664396	0.753418476	2.3612478	259.7909648	216.392099	16.5305826
6142	(2009 HX67)	54953	1.8333848	0.429567931	53.9106759	81.4321895	215.9916687	326.1458703
6143	(2009 HY67)	54949	1.79641388	0.494297085	36.709861	277.6527199	222.1415796	31.5170107
6144	(2009 HZ67)	55200	1.99055064	0.605473565	11.8662864	314.4247986	182.3217294	109.3700747
6145	(2009 HM73)	55200	1.24554885	0.282728576	5.6257719	300.3204894	216.0861672	213.6733551
6146	(2009 HM73)	55200	2.39890497	0.508595234	6.3936394	161.1060084	72.9953715	61.4100701
6147	(2009 HU77)	55200	1.69524441	0.334066281	23.1336855	1.2647445	218.3005959	110.7506274
6148	(2009 HV77)	55200	1.89786271	0.451368423	2.9176114	245.9466197	46.8237305	63.4385928
6149	(2009 HB82)	55200	2.76158876	0.597627477	10.9561886	301.4403856	316.8408571	52.1199804
6150	(2009 HC82)	55200	2.52708163	0.807256797	154.5229609	298.3831029	294.8283582	104.7544906
6151	(2009 HD82)	55200	1.2533436	0.476621036	5.8004227	147.7709291	191.4071916	114.679973
6152	(2009 HF82)	54953	1.54855839	0.44087633	42.5024758	33.4152716	40.4792265	96.0983822
6153	(2009 HM82)	55200	1.27336921	0.302836857	20.4163358	80.013689	218.0905871	125.3374914
6154	(2009 HF88)	55200	2.57460411	0.512385542	24.8339638	283.1344799	222.6332623	88.279107
6155	(2009 JA)	55200	1.42278488	0.326170216	8.1053896	46.1238044	219.520889	121.4021527
6156	(2009 JR)	55200	1.73067999	0.489529667	8.3857369	294.751286	225.7072795	127.0311432
6157	(2009 JS)	54955	1.34627515	0.359390749	6.3857628	112.4452462	43.8625975	33.6084621
6158	(2009 JE1)	54955	1.41447016	0.347618895	8.8778635	232.7543109	45.9964339	332.8865677
6159	(2009 JF1)	55200	1.89130058	0.739137661	6.1467714	280.9156783	45.9761534	74.143984
6160	(2009 JG1)	55200	1.87640778	0.327473646	17.0334036	23.7749419	230.9906629	78.6797103
6161	(2009 JK1)	55200	1.94553951	0.424573117	8.9083018	122.3250001	184.0609473	53.4327716
6162	(2009 JL1)	55200	1.17999185	0.170862715	11.5074471	289.4847814	69.6247449	71.2293973
6163	(2009 JM1)	55200	1.03457817	0.45380004	20.3474727	242.3977852	222.399913	296.8809174
6164	(2009 JG2)	55200	2.0314942	0.658835019	2.7165737	103.8023505	211.8668486	62.1066356
6165	(2009 JL2)	55200	1.8546906	0.471877763	17.8868425	204.7509318	53.0235543	83.7497176
6166	(2009 JM2)	55200	2.39865191	0.606264396	17.1814315	117.2568291	67.6131058	71.9572203
6167	(2009 JO2)	54965	0.90666216	0.484535364	19.9876241	241.2962226	202.7637013	61.1104132
6168	(2009 JQ2)	54965	1.54866044	0.324751048	36.2038918	113.7534499	46.515768	35.784489

#	Object	Epoch	a	e	i	w	Node	M
6169	(2009 JR2)	54966	1.25296245	0.180511613	19.8724553	254.9002178	52.9421848	303.1000319
6170	(2009 JR5)	55200	1.25238136	0.351297538	3.9479701	309.7916126	128.2901453	301.9071498
6171	(2009 KJ)	55200	1.24067794	0.717168954	32.9846557	67.0144992	12.6204387	199.9213841
6172	(2009 KK)	55200	1.50281416	0.455520105	18.2334725	247.2345409	68.2297852	84.7964445
6173	(2009 KL)	54971	1.98516124	0.589293616	6.6283508	307.5043906	221.9539586	17.1500166
6174	(2009 KM)	54972	2.4364175	0.785356765	9.5263085	227.0280923	106.5484219	345.3126659
6175	(2009 KN)	54971	2.96795914	0.662822542	62.581617	85.7267239	63.9712745	19.0962638
6176	(2009 KY1)	55200	1.14766561	0.189752459	9.3666814	281.3571798	236.973866	242.5847644
6177	(2009 KL2)	55200	2.20004289	0.469000116	9.4435821	165.6770801	173.857846	30.2388226
6178	(2009 KV2)	55200	2.11039328	0.389212566	28.941641	339.7723489	236.975648	81.1356449
6179	(2009 KW2)	55200	1.36177159	0.253898074	5.1873344	2.9079497	243.5248155	137.4415918
6180	(2009 KC3)	55200	3.20538064	0.6993442	10.0184622	337.3124373	340.0611869	24.7421787
6181	(2009 KD3)	54977	2.15288963	0.673090759	7.9112566	116.1957901	39.3147972	18.1180626
6182	(2009 KE3)	55200	2.64671999	0.712393928	5.7208463	317.4561371	15.7599887	38.1616568
6183	(2009 KN4)	55200	1.94018699	0.525211453	9.1688839	37.9894961	308.4444013	51.1847702
6184	(2009 KO4)	55200	2.45496588	0.557048715	2.0361484	125.5440172	128.0011922	54.6573994
6185	(2009 KQ4)	55200	1.52924456	0.262772137	6.4846701	135.4002855	58.818169	136.142445
6186	(2009 KR4)	55200	0.84376422	0.238991759	10.7012556	191.2116115	240.0070459	91.3779867
6187	(2009 KT4)	54982	1.27696081	0.202117513	10.9990289	309.1052015	230.7171223	40.9845183
6188	(2009 KD5)	55200	1.04634559	0.261525639	13.472827	294.3442098	104.5713413	92.9987322
6189	(2009 KC7)	55200	2.64285136	0.534059251	15.4216498	357.560059	256.2615567	51.8782403
6190	(2009 KM7)	55200	2.23919213	0.486643315	17.9346548	89.8163206	213.1392322	63.1169173
6191	(2009 KK8)	55200	2.39720563	0.596165163	2.2681306	193.4694589	120.5797827	48.8126044
6192	(2009 KL8)	55200	1.71263808	0.471194505	8.0146795	222.4886796	76.1103042	78.9878932
6193	(2009 KR21)	54982	1.72343844	0.517488887	2.3701245	243.2996086	69.3129425	340.0618832
6194	(2009 KT21)	55200	1.67089325	0.332547106	6.9408317	244.2969663	230.9997355	196.4019695
6195	(2009 KV21)	54984	2.41515699	0.590489813	7.3728262	218.5264419	76.826253	350.0420224
6196	(2009 KJ22)	55200	2.10087109	0.435111784	5.7494452	50.8865804	243.8930499	57.6732074
6197	(2009 LA)	55200	1.24512644	0.310479068	12.49767	288.4646047	249.1669463	195.4136165
6198	(2009 LD)	55200	0.98943569	0.150590994	9.7641412	254.2933278	244.9397477	312.3382055
6199	(2009 LE)	55200	1.30518377	0.234847576	21.2733947	214.8539649	81.3442621	114.7775819
6200	(2009 LQ)	54997	1.5405911	0.592228386	5.3496085	243.9421605	114.6441944	329.2586354
6201	(2009 LS)	55200	1.26292069	0.291279964	44.9967367	176.2410426	252.7712443	346.4122139
6202	(2009 LX)	55200	2.83279532	0.602433023	12.3355864	348.8138561	314.178177	34.9300662
6203	(2009 LQ1)	55200	1.42782452	0.216879966	1.2082575	136.0969874	104.2214916	127.7608661
6204	(2009 LU2)	55200	1.41328856	0.510119552	10.2970519	278.34953	75.0883629	78.8972515
6205	(2009 LV2)	54999	1.50363019	0.594318769	25.9819302	118.7691262	249.3732712	325.9644025
6206	(2009 LW2)	55200	1.20576424	0.259381751	33.1475141	41.05701	101.1484846	261.4649296
6207	(2009 MA)	55200	2.01515896	0.486968975	18.2550672	212.7520602	98.8107614	53.9608108
6208	(2009 MD)	55003	2.32633116	0.527465607	10.4425608	166.9638459	109.889408	359.5473008
6209	(2009 MS)	55200	2.00536988	0.569273389	52.4114714	219.5222202	252.1291888	194.9047507
6210	(2009 MU)	55200	2.29008946	0.607881802	7.3401176	224.1949926	94.3659468	45.3805707
6211	(2009 MW)	55200	0.9126079	0.299078461	21.0042883	23.6272413	87.6232348	353.4570924
6212	(2009 MX)	55200	1.64148263	0.314959442	20.2027716	170.836391	98.6266591	90.7132155
6213	(2009 MG1)	55006	2.02538877	0.629940036	6.83575	101.4771794	87.8795036	19.0937775
6214	(2009 MH1)	55005	1.04302328	0.731916357	34.0208413	358.58947	110.9813154	182.9488867
6215	(2009 ML1)	55200	2.15370604	0.435622542	3.2440885	63.2634695	279.1925482	40.305914
6216	(2009 MM1)	55200	2.37646815	0.499071307	8.8432669	227.8225682	70.1462668	45.9646323
6217	(2009 MX6)	55200	2.15025134	0.562918194	9.026897	76.2920073	271.4715238	36.30709
6218	(2009 MZ6)	55200	2.30976568	0.453312073	5.9300701	150.9740896	134.2992521	51.9889629
6219	(2009 MM8)	55200	1.83546257	0.433730065	3.0754808	203.0393938	94.7957619	66.7968828
6220	(2009 MN8)	55200	2.22843904	0.54268445	3.5151899	325.1289757	282.9116516	64.3778774
6221	(2009 MC9)	55200	2.19921077	0.464564556	9.0668978	342.3953514	326.5813301	46.0220201
6222	(2009 ME9)	55200	0.9234272	0.500824882	31.4747678	207.4875515	274.0693771	358.6408685
6223	(2009 NA)	55200	2.65818619	0.553249781	10.0914786	98.7500213	269.5753	25.159461
6224	(2009 NE)	55200	2.67382121	0.864944998	35.1597384	198.7709068	230.4591412	17.4312673
6225	(2009 NH)	55200	2.17556456	0.486247337	7.3282549	216.614628	145.7166115	31.4346245
6226	(2009 NJ)	55200	1.87076373	0.658830836	8.177712	132.5108109	254.6554006	39.1419176
6227	(2009 NL)	55200	2.8328627	0.680737265	13.6482774	112.0969144	133.5123966	43.8240951
6228	(2009 ND1)	55200	2.7465517	0.566380332	11.7679238	291.2346174	98.7585778	355.3690072
6229	(2009 OC)	55200	2.13535155	0.446457603	4.5730579	138.0063808	178.5713735	47.2612945
6230	(2009 OF)	55200	2.35800113	0.596932609	9.3809307	217.8868754	126.9995381	33.981926
6231	(2009 OG)	55200	2.7052633	0.858755912	48.3313144	114.0828942	309.5720475	20.8562863
6232	(2009 OB3)	55200	2.24749049	0.438865763	26.4138171	217.9765048	107.0067677	47.9109464
6233	(2009 OC3)	55200	2.0519426	0.4709159	1.5552466	125.8655877	175.6016448	55.9630925

#	Object	Epoch	a	e	i	w	Node	M
6234	(2009 OZ4)	55200	2.67911909	0.639182355	38.1130886	240.1231679	140.2706046	21.4116816
6235	(2009 OS5)	55200	1.14415351	0.096645232	1.6946437	120.8002987	145.3866321	163.898184
6236	(2009 OX5)	55041	1.81922222	0.449803626	41.3097051	141.6440448	121.8117874	13.4909152
6237	(2009 OW6)	55200	1.95439216	0.482408597	0.1174255	231.1848824	94.4262766	51.451787
6238	(2009 OY7)	55041	1.37242678	0.275351048	27.6778891	222.2656706	125.1450313	336.4924192
6239	(2009 OZ7)	55200	1.51277136	0.182810626	21.124982	15.2199657	318.122785	68.891139
6240	(2009 OO9)	55044	1.78821743	0.82922976	14.0151044	320.7090198	135.8470288	340.2497269
6241	(2009 OP9)	55200	2.01998564	0.475822378	13.4371344	224.1385546	142.6243196	39.7496994
6242	(2009 PC)	55200	0.99645099	0.342169266	7.076671	48.3794379	134.4775298	246.9412675
6243	(2009 PD)	55200	1.26558699	0.16977527	3.9016963	165.9852575	113.2162854	129.3932581
6244	(2009 PH)	55200	2.19658588	0.445737309	3.7705218	42.6325999	293.1843238	37.6001863
6245	(2009 PN)	55056	2.22482835	0.425712936	5.7783519	260.7525228	359.9722207	18.7737568
6246	(2009 PY)	55200	0.94458407	0.293990787	26.5861456	195.9839765	325.6936599	287.6667126
6247	(2009 PQ1)	55200	1.49739474	0.489378959	5.5936623	271.3687747	327.071628	107.7943291
6248	(2009 PR1)	55200	1.48806387	0.311749507	8.6429526	167.4135214	139.1004226	84.7670161
6249	(2009 PU1)	55200	1.10382003	0.170827755	20.9451149	277.5269502	143.0906305	44.5571753
6250	(2009 PT2)	55200	1.71171077	0.466005322	3.8283909	95.4826731	299.9221676	33.2652886
6251	(2009 PA3)	55059	1.38329626	0.43857475	5.7055019	109.3426238	132.04648	35.8093057
6252	(2009 QC)	55200	2.10862444	0.482082821	6.8270519	149.6789549	155.0169292	51.507596
6253	(2009 QO)	55200	2.14266667	0.41269622	5.2437672	117.5229362	239.8878053	30.9593637
6254	(2009 QR)	55200	1.34242339	0.267397223	3.4153123	209.6248515	150.5163391	68.107931
6255	(2009 QS)	55200	2.11122073	0.596057052	8.2164652	287.1993478	326.5458334	62.1824451
6256	(2009 QT)	55200	1.33266483	0.199176931	12.5175281	327.6034404	318.5044434	116.9853406
6257	(2009 QW1)	55064	2.68752725	0.542677382	18.7528325	173.9898336	132.2006648	4.8771836
6258	(2009 QG2)	55200	2.33121661	0.571885258	3.0401454	39.7623844	305.4138524	33.5098801
6259	(2009 QH2)	55200	2.33497128	0.502293548	4.7367864	103.887905	241.3265109	33.0557124
6260	(2009 QJ2)	55200	1.77583724	0.415847236	11.9665784	156.205947	143.4837006	67.1747647
6261	(2009 QK2)	55200	3.04734692	0.623374952	16.6010968	69.5008073	205.1522193	39.729417
6262	(2009 QL2)	55200	2.60954804	0.592327112	17.0557191	329.9679454	324.2733958	40.6858662
6263	(2009 QM5)	55200	2.1116738	0.411324514	3.3220805	135.5511132	171.4176378	52.8724271
6264	(2009 QN5)	55200	2.38863001	0.833807156	14.7065912	136.6763217	328.8076701	19.4013772
6265	(2009 QO5)	55200	1.59516583	0.238025652	8.5550395	188.5588417	145.843373	67.3017569
6266	(2009 QH6)	55200	1.058452	0.186714151	14.2665786	103.8754851	323.8602911	47.3675896
6267	(2009 QJ6)	55064	1.38656064	0.231734834	29.4712408	187.3261942	152.7405441	354.9477084
6268	(2009 QZ6)	55200	1.59539307	0.233215184	18.9108384	304.5638946	281.8314191	160.9280159
6269	(2009 QE8)	55200	2.20363985	0.443881802	8.4785455	295.2894947	334.2619926	70.027842
6270	(2009 QL8)	55200	1.93137841	0.54106829	4.2392253	339.474824	84.5553794	19.619203
6271	(2009 QO8)	55200	1.88199368	0.341887042	32.9999408	256.9508156	341.8306163	100.9327993
6272	(2009 QQ8)	55200	1.48457884	0.203033789	27.2942296	151.6199654	155.4715904	89.6605755
6273	(2009 QR8)	55200	2.11698552	0.451376703	5.6346131	178.4899045	137.3355012	50.2833909
6274	(2009 QJ9)	55200	2.72259383	0.615350844	19.588843	200.6474854	158.5614788	23.2083425
6275	(2009 QK9)	55200	1.83431563	0.541435372	14.2638132	239.7071242	156.6911085	33.4917937
6276	(2009 QC23)	55200	2.09470107	0.518055811	3.9580026	336.8577391	328.6749912	50.3208878
6277	(2009 QF31)	55200	1.48456012	0.142865773	42.4141311	167.8110638	336.2846441	267.4234186
6278	(2009 QL32)	55076	2.02850899	0.603326128	5.7955718	101.9761198	163.5704741	18.8945064
6279	(2009 QY33)	55200	1.47320128	0.28277415	23.0088791	285.5485756	162.1141708	356.8520451
6280	(2009 QD34)	55200	2.43460081	0.491954558	6.4126344	252.4063079	98.6608872	36.4342854
6281	(2009 QE34)	55200	1.28940477	0.232049029	2.6258386	163.4111378	142.83414	105.6122463
6282	(2009 QF34)	55200	2.14962105	0.435976877	1.8520349	162.8806399	166.0344417	44.8211435
6283	(2009 QG34)	55200	2.75248436	0.651161686	22.140818	300.3209017	3.3954286	35.5414696
6284	(2009 QH34)	55200	2.29316883	0.559198552	3.0633361	189.0151096	161.0659861	32.8912588
6285	(2009 QZ34)	55200	1.77310635	0.429907585	2.3999554	229.6177203	171.7969554	28.0020678
6286	(2009 QA35)	55200	2.64777298	0.559277797	12.3090131	340.27144	335.2508121	34.7461266
6287	(2009 QB35)	55200	2.2844217	0.500168563	5.0444336	157.2803665	226.3228884	26.9756093
6288	(2009 QC35)	55200	2.19031742	0.569727158	1.0628472	228.8471888	147.4962123	29.0243721
6289	(2009 QB36)	55200	2.2447227	0.78692659	15.6295851	176.5314665	310.245827	11.7338453
6290	(2009 QC36)	55200	1.49299021	0.387133927	6.8126037	89.6940892	186.5029906	97.0460391
6291	(2009 RH)	55200	1.24711653	0.306462253	3.5458141	264.5554254	165.7749523	31.5698104
6292	(2009 RM)	55200	2.78569963	0.553315647	7.9886741	324.6663675	348.8737468	28.9931287
6293	(2009 RN)	55200	2.84058991	0.613610257	3.3943979	310.006698	93.5155091	12.8284048
6294	(2009 RR)	55200	1.40547329	0.465232721	6.0912752	256.7563204	310.2437676	33.7946962
6295	(2009 RD1)	55200	2.57203489	0.536780874	2.1130044	0.2235106	353.6553758	24.9489369
6296	(2009 RT1)	55200	1.15644002	0.106850916	4.1480483	136.3037711	159.7872832	132.6354084
6297	(2009 RU1)	55089	1.34969405	0.378753309	0.8547552	329.5963555	301.0016376	40.7567052
6298	(2009 RV1)	55200	2.70084469	0.637363965	1.899609	56.2902501	2.2034718	12.8334333

#	Object	Epoch	a	e	i	w	Node	M
6299	(2009 RG2)	55200	1.55212791	0.372092429	3.0528366	38.0844582	353.8778882	39.0918886
6300	(2009 RH2)	55200	2.36891031	0.482522368	5.7940656	348.6179312	0.4734702	30.4079227
6301	(2009 RY3)	55089	1.05399968	0.472926491	27.872577	65.8955386	169.2986581	60.960733
6302	(2009 RZ3)	55200	2.21060632	0.675323939	52.6418174	114.249334	344.7862827	1.8260956
6303	(2009 RA4)	55200	2.26662096	0.44813889	6.1953145	345.1367117	358.3226037	35.4443489
6304	(2009 RB4)	55200	1.63875708	0.300882443	9.5417176	74.9201786	182.2585809	125.0059545
6305	(2009 RD4)	55200	2.72790675	0.598158918	22.507677	9.9306035	8.443513	17.5554838
6306	(2009 RX4)	55090	1.31718562	0.189700987	14.6526954	21.0340767	349.5662502	348.1596137
6307	(2009 SA)	55092	2.20154688	0.480019677	14.1878468	166.7875945	177.4808174	3.2861828
6308	(2009 SB)	55200	2.2059075	0.804117117	5.4606509	268.9575967	217.8349791	1.0360515
6309	(2009 SD)	55092	1.73579992	0.567261751	3.0500382	287.054412	344.3277871	25.4786803
6310	(2009 SF)	55091	1.53977712	0.293519825	30.4530377	14.8324564	353.5144146	352.885341
6311	(2009 SG)	55200	2.39526992	0.512202412	39.7554325	38.1813755	1.2300361	16.2528392
6312	(2009 SH)	55093	2.4569792	0.564067198	18.8780259	37.2434132	350.669806	352.2951973
6313	(2009 SJ)	55091	1.23078248	0.264562242	10.0856226	246.0306716	176.9751198	317.5843474
6314	(2009 SK)	55095	2.63740762	0.601665317	0.7773223	23.2849503	341.454599	358.8037917
6315	(2009 SL)	55091	1.34862474	0.257963092	19.6705981	214.6264996	174.7391413	339.3354981
6316	(2009 SM)	55200	1.7714661	0.33634696	20.6456099	273.418248	22.1681874	83.6963725
6317	(2009 SN)	55093	1.41908061	0.317733588	26.2921869	37.9352782	344.6813346	346.0450077
6318	(2009 SP)	55200	2.2207193	0.49345212	25.288244	256.1472003	178.1312544	1.242576
6319	(2009 SQ)	55200	2.7058077	0.86379106	33.7147188	140.2845815	341.4881734	7.7441908
6320	(2009 SS)	55091	0.90812086	0.200335036	9.4438122	161.9440277	350.5461619	211.2735342
6321	(2009 ST)	55200	1.95618407	0.368173921	10.8982246	269.8145327	189.3245053	336.9196179
6322	(2009 SU)	55200	2.29938375	0.49610516	8.929242	144.1472806	176.9183788	41.4686546
6323	(2009 SV)	55200	1.47591922	0.278707769	24.9624662	4.6088249	185.4333365	212.3333476
6324	(2009 SW)	55200	2.01963372	0.437114656	6.9861423	203.8705858	191.0845245	22.3396846
6325	(2009 SY)	55092	1.26205679	0.448352346	15.5003928	57.0257681	176.2594949	69.5693859
6326	(2009 SC1)	55094	1.74393162	0.501411909	7.553744	108.3402685	179.7332004	23.8788146
6327	(2009 SD1)	55093	1.71920218	0.505735526	32.0531358	61.8922477	1.0684403	338.9581853
6328	(2009 SH1)	55092	1.19706619	0.245176746	3.3092694	294.8076083	354.9258484	41.7532909
6329	(2009 SJ1)	55200	1.57866003	0.352252647	11.6202581	339.7121153	354.9359101	62.9586242
6330	(2009 SK1)	55200	1.61103052	0.22292061	30.8175142	104.4272089	184.4403676	120.2692186
6331	(2009 SL1)	55092	1.88857479	0.465292976	8.5800874	129.8329992	174.5394174	17.5530539
6332	(2009 SM1)	55094	2.18729549	0.501599633	0.4003422	8.9665436	323.1225383	7.3346332
6333	(2009 SN1)	55095	1.95737927	0.477650621	4.1485523	33.6981377	357.5650716	349.3986248
6334	(2009 SW1)	55200	2.11144573	0.566164401	2.0570945	347.2534274	316.9673872	38.3273002
6335	(2009 SX1)	55200	1.72255888	0.447053032	8.2856052	115.1248612	335.238777	12.2523868
6336	(2009 SF2)	55200	2.25143823	0.448724351	6.422715	59.804709	334.4755725	21.3166552
6337	(2009 SG2)	55200	1.12119491	0.170194295	25.9794382	252.8683031	9.1237208	163.7438165
6338	(2009 SH2)	55200	0.99892545	0.09365775	6.8023547	98.0356105	7.0286945	7.6841416
6339	(2009 SJ2)	55093	2.52645745	0.511416105	12.3840713	354.5588287	355.322963	1.5050139
6340	(2009 SK2)	55200	1.71921647	0.471481989	38.2409905	257.0920328	24.0199644	94.9147664
6341	(2009 SL2)	55200	1.04640009	0.248948637	23.7418416	224.5870967	4.9951543	195.5977779
6342	(2009 SB15)	55200	2.04796906	0.677934585	4.169178	169.6976475	313.7331525	356.451367
6343	(2009 SC15)	55200	1.26453231	0.178800919	6.8408929	333.6023617	178.7492747	284.7020673
6344	(2009 SD15)	55095	2.33926558	0.62547626	2.8960408	303.4742681	357.0515268	11.8364633
6345	(2009 SH15)	55200	1.82935921	0.453116564	9.7544099	22.6296106	359.0582568	33.8964097
6346	(2009 SJ15)	55097	1.37886726	0.255369003	18.3804466	212.7143624	177.967898	343.5900417
6347	(2009 SK15)	55200	1.12484354	0.101887134	16.2259095	22.3459933	358.8471842	68.5425422
6348	(2009 SV17)	55200	2.7021599	0.586763915	3.4388461	125.7899439	322.625898	354.0211069
6349	(2009 SW17)	55200	2.01168353	0.598263252	8.4450903	41.6559553	42.7982796	13.8062186
6350	(2009 SX17)	55200	2.33793598	0.540423581	1.4058604	60.1968877	304.5298734	27.2681701
6351	(2009 SG18)	55200	3.01975066	0.671861149	58.4776231	204.0190944	177.7162914	8.0578749
6352	(2009 SJ18)	55200	0.94506669	0.111434185	12.5573497	172.5220075	0.4772313	302.3189984
6353	(2009 ST19)	55200	2.36461676	0.591752591	6.6893229	336.4038243	0.4938518	34.5272596
6354	(2009 SU19)	55200	2.080582	0.89965373	14.5085067	342.4557533	172.7804471	333.4905194
6355	(2009 SV19)	55098	2.20385594	0.528671554	5.2384748	8.8540894	357.3817093	358.3763433
6356	(2009 SW19)	55200	1.26181608	0.327474889	62.8664389	38.3376043	184.0468979	182.7667364
6357	(2009 SM98)	55103	2.43357208	0.700810073	7.503255	110.8449703	166.9663057	15.4380866
6358	(2009 SN98)	55200	1.98331603	0.406948942	6.5277937	305.2473444	151.6420492	345.9659359
6359	(2009 SO98)	55200	1.21884905	0.18819731	18.454503	43.6152729	5.0459958	42.3631814
6360	(2009 SZ99)	55200	0.81489576	0.214322381	21.3144235	147.4504257	338.0970004	27.46937
6361	(2009 SA100)	55200	1.14310471	0.285811343	3.8314696	109.785308	160.7620764	139.2280425
6362	(2009 SB100)	55200	1.88279842	0.439423699	6.7164319	170.0604749	191.3968547	38.9415827
6363	(2009 SC100)	55103	2.48469688	0.58412039	13.8534637	37.9943423	1.9799726	352.4503744

#	Object	Epoch	a	e	i	w	Node	M
6364	(2009 SM103)	55200	2.83320213	0.558206657	12.7564867	26.1085239	300.5215212	26.459798
6365	(2009 SN103)	55200	1.2995211	0.265508586	3.594427	39.3792296	5.6996756	42.0004268
6366	(2009 SO103)	55200	2.0037241	0.663952543	29.4695638	304.609137	194.7858947	340.2055754
6367	(2009 SQ103)	55100	2.27770715	0.52981652	8.1236887	331.1076093	2.6479039	7.898171
6368	(2009 SR103)	55102	1.48400846	0.361317772	10.4259623	59.283815	0.2122741	334.1513146
6369	(2009 SS103)	55100	1.04158605	0.257422068	23.8618005	160.434184	358.9665731	219.5399396
6370	(2009 ST103)	55200	2.68907991	0.721697656	15.9343959	233.7769095	227.2937275	0.7187149
6371	(2009 SK104)	55102	2.76685221	0.616061547	4.1474055	285.791368	328.4522775	36.6171742
6372	(2009 SL104)	55200	1.78920777	0.444958156	2.8143091	105.7272492	296.851721	26.8680501
6373	(2009 SM104)	55200	0.98173141	0.36768992	9.6815037	138.8894589	0.8800058	2.4862879
6374	(2009 SN104)	55101	2.08264074	0.454643888	8.6364224	146.5984808	168.5333508	15.3480487
6375	(2009 SO104)	55101	1.29391071	0.176009497	21.2159439	341.8203711	4.4512572	11.8352549
6376	(2009 SP104)	55101	1.09029213	0.532634345	4.7515369	66.741452	177.7780358	55.8943706
6377	(2009 SQ104)	55200	1.28376179	0.27938059	4.0125376	95.4052781	56.6484131	296.9867248
6378	(2009 SR104)	55101	2.14380128	0.548016004	13.0462019	316.231955	5.3780671	11.0580791
6379	(2009 SS104)	55200	2.61162702	0.508823353	16.4022875	198.7622482	187.5228831	18.3901451
6380	(2009 ST104)	55101	1.94699167	0.568164803	8.3858821	253.755548	179.2492043	341.0982659
6381	(2009 SU104)	55200	2.4763279	0.702791	1.1448888	82.7043622	354.5695269	13.1665238
6382	(2009 SB170)	55200	1.34504269	0.741722886	29.7791824	44.9142053	189.8694296	118.577291
6383	(2009 SC170)	55102	1.41706141	0.302688215	3.3719046	325.8825172	8.6230129	16.2539995
6384	(2009 SP171)	55200	1.35550439	0.356114693	25.6150987	285.1667984	223.1634732	307.8501363
6385	(2009 SQ171)	55103	1.52671834	0.291212599	7.6039387	176.4347398	186.0034648	1.6347047
6386	(2009 SR171)	55200	1.20255293	0.271525156	16.4813884	80.1315946	4.6365192	22.485723
6387	(2009 SS171)	55106	1.636361	0.333175639	16.1285631	199.7605554	185.7199902	351.9667178
6388	(2009 ST171)	55200	2.57948598	0.60743041	3.7376255	205.9778394	186.5766919	17.7661597
6389	(2009 SU171)	55103	1.21631111	0.484937475	10.4746393	241.6974432	10.5397429	55.3644022
6390	(2009 SV171)	55200	2.63234759	0.589189551	12.9802437	233.2288327	209.3506354	6.3956546
6391	(2009 SW171)	55200	1.3309743	0.233228432	3.0564383	150.0787613	188.0919714	79.8489759
6392	(2009 SQ172)	55200	2.57479131	0.497731185	28.3103752	253.034939	138.9587473	15.4557847
6393	(2009 SS172)	55200	1.57025175	0.358536674	15.0921709	312.7892961	1.6647033	73.9012052
6394	(2009 SC229)	55200	2.1448499	0.472256535	6.9298543	22.6303508	295.3564159	53.3933474
6395	(2009 SD229)	55200	2.0994019	0.409242902	8.1087977	180.8682001	124.1868324	70.6686651
6396	(2009 TB)	55106	1.75712237	0.487211622	6.4743112	313.9163536	7.7878119	15.3481497
6397	(2009 TJ)	55200	2.06916893	0.591125314	4.8572481	36.4894987	34.4431739	15.4823283
6398	(2009 TK)	55200	1.30878763	0.204853087	20.1766376	181.0072089	192.8216682	56.5703635
6399	(2009 TP)	55200	1.02932383	0.224252262	0.7904567	103.5584498	15.2567682	2.2129615
6400	(2009 TQ)	55200	1.25553293	0.235595739	12.8902146	46.6236315	16.3615412	31.2781452
6401	(2009 TS)	55200	1.8174639	0.463558945	8.4951561	34.8943918	14.5071498	23.7052901
6402	(2009 TT)	55200	2.32998282	0.570940079	11.489123	203.7080222	199.8882326	17.5697578
6403	(2009 TU)	55200	1.72400211	0.558488508	1.5512666	106.0370941	199.1671648	57.9921972
6404	(2009 TA1)	55200	2.29073886	0.663565943	12.3471136	271.6964547	204.1603743	3.3704745
6405	(2009 TB3)	55200	1.31920961	0.219542321	12.2247916	249.4944967	22.2287593	149.2185502
6406	(2009 TJ4)	55200	1.09034885	0.125194091	9.2233471	249.0879803	201.4669254	14.6702608
6407	(2009 TL4)	55200	1.85323342	0.38710222	6.4743975	160.2711715	212.213816	33.7253541
6408	(2009 TV4)	55200	1.68994661	0.369714772	7.5856581	14.6423751	354.0406321	40.4067542
6409	(2009 TS7)	55120	2.24623562	0.613981817	4.5241539	40.6289601	260.5113988	19.7980997
6410	(2009 TB8)	55200	2.17560374	0.676402775	9.9823328	224.2447669	278.1451625	341.4150129
6411	(2009 TC8)	55200	2.01919862	0.526418929	14.9508675	356.4459545	249.1267574	100.0538964
6412	(2009 TD8)	55200	0.88485992	0.243366315	5.0996683	146.6750469	20.6403957	328.0801995
6413	(2009 TF8)	55200	1.62394604	0.398240311	4.3241684	211.193125	201.3836473	26.2074161
6414	(2009 TG8)	55200	1.8131993	0.329113505	17.4664112	245.2397454	219.415406	4.185813
6415	(2009 TH8)	55200	2.04587249	0.592892003	4.9289534	49.7272168	31.1033287	12.962353
6416	(2009 TK8)	55200	0.92941589	0.340210344	21.1568061	222.203482	29.3078277	190.8624655
6417	(2009 TL8)	55122	2.45149594	0.558126006	4.1108195	71.0436263	294.1526309	4.2508762
6418	(2009 TM8)	55200	1.58748922	0.416396937	2.1532806	218.7361995	205.8388028	22.8204336
6419	(2009 TN8)	55200	1.53691878	0.326131055	13.4170439	197.0698152	203.9420614	31.7976163
6420	(2009 TO8)	55200	2.02425058	0.538247816	4.6928351	36.5841349	29.12591	15.7471663
6421	(2009 TP8)	55119	1.28081287	0.178070821	13.0054054	163.6364497	204.0103878	9.8179903
6422	(2009 TQ8)	55121	1.28454357	0.422907653	13.6259989	95.626579	24.9473704	311.3085306
6423	(2009 TE10)	55121	1.01289532	0.248234067	44.7395758	346.6124832	218.3019219	93.8863923
6424	(2009 TF10)	55200	1.6650601	0.342939461	5.2714982	201.8874407	204.9659345	23.7115768
6425	(2009 TG10)	55200	1.97440637	0.424176946	40.9433852	12.1505455	210.707124	162.8665695
6426	(2009 TM10)	55200	2.43364004	0.470479825	2.786261	284.1556795	131.1436739	9.2237541
6427	(2009 TK12)	55200	1.69604635	0.585038589	3.8415147	245.1974233	245.8747526	358.9547795
6428	(2009 TD17)	55200	1.1270094	0.219897849	0.0775557	82.0023884	219.2759503	123.0107157

#	Object	Epoch	a	e	i	w	Node	M
6429	(2009 UA)	55122	1.70550834	0.377084872	4.2058591	34.0810347	342.6269339	2.5277947
6430	(2009 UB)	55121	1.33138732	0.289093255	3.5096587	299.675174	21.7166863	35.0895359
6431	(2009 UC)	55200	0.76034316	0.346228397	24.7318949	185.3874834	22.4290105	288.300429
6432	(2009 UD)	55200	1.03851379	0.12153661	4.4102291	261.5638095	203.8467297	5.4253671
6433	(2009 UE)	55200	1.98895177	0.505394534	3.7975418	9.0230735	29.6878113	23.2717991
6434	(2009 UF)	55123	1.7499252	0.422858183	28.8591269	314.2680278	20.7400589	19.292947
6435	(2009 UG)	55200	0.78942203	0.374500789	4.905547	201.7490605	14.0784055	264.9231542
6436	(2009 UJ)	55122	2.59664352	0.660933207	7.2838421	51.3674754	24.5925409	351.1877133
6437	(2009 UK)	55200	1.97736079	0.481625876	3.5207215	309.2687313	165.6742945	349.6126502
6438	(2009 UL)	55123	1.24763027	0.416659483	13.7471391	312.1981653	194.2045461	284.4466468
6439	(2009 UM)	55200	1.06970983	0.371117971	18.2440436	217.9439556	37.1711423	181.5494338
6440	(2009 UN)	55123	2.82672818	0.579388385	2.3588601	6.8496228	34.8610187	358.9802736
6441	(2009 UQ)	55200	1.78765025	0.535846369	14.5061774	305.8717615	8.846368	53.4197431
6442	(2009 UK1)	55200	2.18363132	0.566640907	0.5682661	45.9825337	11.0369507	16.3567873
6443	(2009 UL1)	55122	1.34385175	0.428259771	33.2763412	272.3479268	201.4103956	317.3080535
6444	(2009 UM1)	55123	0.96378309	0.602621239	8.9259153	334.1098559	193.7301204	278.2853018
6445	(2009 UN1)	55123	2.43039982	0.563577708	1.5060615	39.2282327	1.9806199	356.4056963
6446	(2009 UO1)	55123	1.52177523	0.471508114	4.0154011	107.2278903	207.5270396	27.8365567
6447	(2009 UP1)	55126	1.50384741	0.397537971	17.1156871	195.8315463	237.1413817	339.8939584
6448	(2009 UU1)	55200	1.19334963	0.33100055	11.647524	79.3316622	29.4996596	10.5613274
6449	(2009 UD2)	55200	1.39236416	0.322846694	3.8150214	106.6146726	2.935356	352.6830404
6450	(2009 UE2)	55126	1.49704382	0.458310288	7.7373509	156.7973544	325.006491	304.2399748
6451	(2009 UF2)	55126	2.85530488	0.637505617	2.5169667	253.5660191	161.4323848	354.6215534
6452	(2009 UW2)	55200	2.47583608	0.572920109	12.6585768	225.0795174	191.2933198	10.0047662
6453	(2009 UM3)	55200	2.43133026	0.788765531	12.6994025	128.4143062	162.762901	37.2361117
6454	(2009 UN3)	55200	2.32748463	0.576027503	37.4081683	338.8062816	142.0098341	354.6119881
6455	(2009 UO3)	55200	2.45262158	0.581278247	8.5271051	0.3883315	23.936334	19.583688
6456	(2009 UJ5)	55200	2.41914484	0.58544432	8.0525039	345.3761299	27.9789838	22.7338187
6457	(2009 UP5)	55128	1.8156551	0.347641528	33.8985845	355.0725795	16.643554	2.1205935
6458	(2009 UQ5)	55131	2.07776623	0.4683819	3.3560447	188.5190115	217.4619823	356.0603114
6459	(2009 UR5)	55126	0.77237061	0.367774498	6.6098737	345.6718874	215.4205179	197.1178218
6460	(2009 UJ14)	55127	3.34027597	0.684477806	59.8813852	103.0223369	209.7744435	13.8263278
6461	(2009 UK14)	55200	1.74938986	0.466726619	2.1772846	52.6436335	26.339774	13.9235694
6462	(2009 UX17)	55200	1.18876984	0.083374995	10.7777731	278.4899157	216.1749305	323.2481049
6463	(2009 UY17)	55200	0.81849485	0.316107793	42.0419872	30.5521568	202.0955676	233.6866756
6464	(2009 UZ17)	55200	2.44105138	0.623894944	4.2630184	192.4767314	152.9580817	27.4447959
6465	(2009 UB18)	55200	3.17717907	0.6325498	8.3416875	62.6830367	86.8149922	357.4191528
6466	(2009 UW18)	55200	1.27903504	0.439000478	16.9955291	59.7629872	227.2995815	112.8668698
6467	(2009 UA19)	55128	1.86583592	0.352939652	45.4354431	106.8446399	8.4959657	295.4960709
6468	(2009 UB19)	55130	1.9364697	0.454602435	2.5309539	150.3743119	208.6200091	10.0194982
6469	(2009 UC19)	55200	1.08132548	0.298168314	11.0059482	81.9826616	212.0612531	125.7601458
6470	(2009 UD19)	55134	1.67242909	0.417538283	3.5724517	241.4151764	204.7200516	304.8955105
6471	(2009 UE19)	55200	2.63836148	0.536601914	19.9767339	349.1467779	42.3521699	18.7421582
6472	(2009 US19)	55130	1.74581692	0.470384026	10.0917086	229.3869229	211.7402681	342.3421731
6473	(2009 UT19)	55129	0.88926698	0.658239775	9.5681399	328.390248	212.6165401	265.8500079
6474	(2009 UM19)	55129	1.46066416	0.238158766	17.4201738	153.0371567	207.8949257	18.0374831
6475	(2009 UV19)	55129	1.70392015	0.412443344	1.8475943	280.3667436	58.195673	21.5693208
6476	(2009 UW19)	55129	1.65302259	0.406353095	25.9306491	296.9275224	37.8212725	25.787109
6477	(2009 UX19)	55200	1.2530852	0.832075316	15.973524	100.5018232	61.1909076	11.7894427
6478	(2009 UY19)	55200	1.01950627	0.031164649	9.0517154	94.1870106	33.3076343	336.0516186
6479	(2009 UZ19)	55200	1.62180402	0.377774787	5.2488312	4.8656035	35.1476299	30.4347441
6480	(2009 UK20)	55200	1.05614913	0.207323898	2.8603513	277.9250239	216.2268618	346.0789763
6481	(2009 UL20)	55132	2.48401145	0.553255349	2.0414894	170.2347562	194.8740552	7.3026843
6482	(2009 UK28)	55200	2.17774212	0.409862201	27.4165487	330.1060627	52.6977581	27.3719806
6483	(2009 UL28)	55133	2.01998164	0.531448707	2.8630078	235.0183387	206.4200572	347.4004467
6484	(2009 UM28)	55132	1.89175941	0.432424531	8.7984936	9.6623222	32.7621658	356.4289028
6485	(2009 US87)	55134	1.64435134	0.240772439	0.537342	322.7704482	104.6409201	345.4798924
6486	(2009 UT87)	55132	2.60533224	0.570696781	8.7790078	331.4401595	35.5304447	5.2805783
6487	(2009 UU87)	55131	1.67584595	0.395033049	16.9420591	207.4242631	216.3549764	348.1876041
6488	(2009 UV87)	55132	2.53308291	0.582355813	10.5646361	179.759631	213.3868062	0.1200966
6489	(2009 UW87)	55200	1.9377005	0.541946	1.243868	234.5064241	209.6549687	11.1682823
6490	(2009 UX87)	55200	1.09588732	0.1138729	12.9094336	57.2611921	35.3258896	10.7389784
6491	(2009 UY87)	55137	2.23082621	0.690900127	7.9923207	135.3481119	354.4492663	345.6763944
6492	(2009 UZ87)	55200	0.9237096	0.188077039	3.7800684	45.2514641	218.5667818	189.0096582
6493	(2009 VA)	55141	1.42803085	0.357388274	7.5419194	223.9910222	224.5419169	338.9483913

#	Object	Epoch	a	e	i	w	Node	M
6494	(2009 VP)	55200	1.37308361	0.331660793	21.6197682	291.8668967	48.3861	69.3567925
6495	(2009 VQ)	55200	2.4220964	0.58443353	4.7717033	353.6966505	44.1531514	16.5423569
6496	(2009 VR)	55200	1.56962386	0.395560127	5.0563235	41.4402074	45.4887199	11.2395521
6497	(2009 VS)	55144	1.29053829	0.334826018	14.0172096	105.6306645	227.3320357	39.8669047
6498	(2009 VT)	55144	1.37600537	0.404627129	3.4483692	300.173398	214.87812	297.5256666
6499	(2009 VW)	55145	1.44064279	0.563060735	7.1746081	255.9187238	54.5617275	34.2060439
6500	(2009 VX)	55144	2.58398174	0.669280805	6.8282567	52.0708508	47.2986376	351.1418902
6501	(2009 VZ)	55145	1.40069791	0.319243429	12.1295462	221.3851284	233.7484962	336.2479829
6502	(2009 VA1)	55144	2.59049662	0.597381989	34.9601217	134.7971324	207.4618507	7.9992856
6503	(2009 VB1)	55145	1.57971957	0.294317602	30.6686274	218.3856984	228.0249814	338.5988476
6504	(2009 VC1)	55145	1.80129871	0.509633263	4.1276226	233.4754005	231.8564841	341.7970414
6505	(2009 VN1)	55145	1.00975872	0.179110543	22.699651	48.0065105	230.7996161	114.7090493
6506	(2009 VT1)	55145	2.00279412	0.507498668	0.2811711	176.7108513	218.3794459	3.5381509
6507	(5025 P-L)	55200	2.52767262	0.744787236	3.785467	152.8871706	346.2144642	131.6603735
6508	(6344 P-L)	55200	2.80314669	0.667426092	4.7286721	234.0269717	183.6291368	163.4003275

Appendix B: Comet Ephemerides

#	Object	Epoch	e	i	w	Node	r _p	r _a
1	1P/Halley	49400	0.9671	162.2627	111.3325	58.4201	0.5860	35.08
2	2P/Encke	55044	0.8479	11.7828	186.4988	334.5696	0.3370	4.1
3	3D/Biela	-9480	0.7513	13.2164	221.6588	250.6690	0.8791	6.19
4	5D/Brorsen	7440	0.8098	29.3821	14.9468	102.9676	0.5898	5.61
5	7P/Pons-Winnecke	54587	0.6349	22.3104	172.3264	93.4231	1.2533	5.61
6	8P/Tuttle	54374	0.8198	54.9832	207.5092	270.3417	1.0271	10.37
7	12P/Pons-Brooks	35000	0.9548	74.1769	199.0285	255.8911	0.7737	33.47
8	13P/Olbers	35760	0.9303	44.6099	64.6412	86.1031	1.1785	32.64
9	15P/Finlay	54841	0.7214	6.8168	347.4960	13.8066	0.9700	5.99
10	18D/Perrine-Mrkos	40240	0.6426	17.7590	166.0504	240.8755	1.2722	5.85
11	20D/Westphal	20080	0.9198	40.8901	57.0810	348.0064	1.2540	30.03
12	21P/Giacobini-Zinner	53803	0.7056	31.8111	172.5355	195.4289	1.0379	6.01
13	23P/Brorsen-Metcalf	47800	0.9720	19.3339	129.6107	311.5855	0.4788	33.66
14	24P/Schaumasse	52120	0.7048	11.7515	57.8745	79.8310	1.2050	6.96
15	26P/Grigg-Skjellerup	54679	0.6330	22.3559	1.7181	211.7004	1.1167	4.97
16	27P/Crommelin	45880	0.9192	29.1013	195.8408	250.9003	0.7345	17.44
17	34D/Gale	29080	0.7607	11.7281	209.1572	67.9235	1.1829	8.7
18	35P/Herschel-Rigollet	29480	0.9741	64.2070	29.2980	355.9800	0.7485	56.94
19	41P/Tuttle-Giacobini-Kresak	53821	0.6604	9.2280	62.1932	141.0929	1.0478	5.12
20	45P/Honda-Mrkos-Pajdusakova	53795	0.8246	4.2533	326.1071	89.1156	0.5303	5.52
21	46P/Wirtanen	54679	0.6581	11.7395	356.3406	82.1718	1.0574	5.13
22	55P/Tempel-Tuttle	51040	0.9056	162.4866	172.5003	235.2710	0.9764	19.7
23	66P/du Toit	52920	0.7877	18.7007	257.2497	22.2154	1.2743	10.73
24	67P/Churyumov-Gerasimenko	54952	0.6402	7.0409	12.6986	50.1977	1.2465	5.68
25	72P/Denning-Fujikawa	43880	0.8199	8.6432	334.3171	41.5334	0.7797	7.88

26	73P/Schwassmann-Wachmann 3	50080	0.6948	11.4235	198.7700	69.9463	0.9328	5.18
27	73P/Schwassmann-Wachmann 3-B	53880	0.6933	11.3970	198.7995	69.8925	0.9391	5.18
28	73P/Schwassmann-Wachmann 3-C	53880	0.6932	11.3958	198.8053	69.8954	0.9391	5.18
29	73P/Schwassmann-Wachmann 3-E	51920	0.6939	11.4056	198.7732	69.9171	0.9374	5.19
30	73P/Schwassmann-Wachmann 3-G	53839	0.6934	11.3896	198.7746	69.9084	0.9392	5.19
31	73P/Schwassmann-Wachmann 3-H	53839	0.6936	11.3911	198.7738	69.9079	0.9392	5.19
32	73P/Schwassmann-Wachmann 3-J	53815	0.6915	11.3803	198.8694	69.8289	0.9390	5.15
33	73P/Schwassmann-Wachmann 3-K	53839	0.6935	11.3911	198.7896	69.8973	0.9391	5.19
34	73P/Schwassmann-Wachmann 3-L	53839	0.6947	11.3987	198.7476	69.9368	0.9391	5.21
35	73P/Schwassmann-Wachmann 3-M	53839	0.6939	11.3944	198.7776	69.9053	0.9391	5.2
36	73P/Schwassmann-Wachmann 3-N	53839	0.6923	11.3809	198.7644	69.8973	0.9393	5.17
37	73P/Schwassmann-Wachmann 3-P	53839	0.6956	11.4054	198.7241	69.9562	0.9392	5.23
38	73P/Schwassmann-Wachmann 3-Q	53839	0.6986	11.4194	198.4952	70.1379	0.9397	5.3
39	73P/Schwassmann-Wachmann 3-R	53839	0.6941	11.3947	198.7697	69.9131	0.9391	5.2
40	73P/Schwassmann-Wachmann 3-S	53839	0.6934	11.0482	181.5622	81.9916	1.0224	5.65
41	73P/Schwassmann-Wachmann 3-T	53839	0.7119	11.5123	198.1834	70.4760	0.9393	5.58
42	73P/Schwassmann-Wachmann 3-U	53839	0.6894	11.3598	198.8354	69.8327	0.9394	5.11
43	73P/Schwassmann-Wachmann 3-V	53839	0.6935	11.6518	204.9295	65.2468	0.9122	5.04
44	73P/Schwassmann-Wachmann 3-W	53839	0.6976	11.4183	198.6608	70.0170	0.9391	5.27
45	73P/Schwassmann-Wachmann 3-X	53839	0.6948	11.3994	198.7510	69.9286	0.9391	5.21
46	73P/Schwassmann-Wachmann 3-Y	53839	0.7195	11.5618	197.9701	70.6691	0.9392	5.76
47	73P/Schwassmann-Wachmann 3-Z	53839	0.6934	11.3495	198.0161	70.4940	0.9420	5.2
48	73P/Schwassmann-Wachmann 3-AA	53839	0.6806	11.2951	199.1079	69.5727	0.9393	4.94
49	73P/Schwassmann-Wachmann 3-AB	53856	0.6912	11.3732	198.8170	69.8589	0.9392	5.14
50	73P/Schwassmann-Wachmann 3-AC	53856	0.6954	11.4053	198.7526	69.9338	0.9390	5.23

51	73P/Schwassmann-Wachmann 3-AD	53839	0.6934	11.3684	198.3713	70.2192	0.9407	5.19
52	73P/Schwassmann-Wachmann 3-AE	53839	0.6967	11.4147	198.7081	69.9723	0.9391	5.25
53	73P/Schwassmann-Wachmann 3-AF	53839	0.6763	11.2397	198.7164	69.8497	0.9412	4.87
54	73P/Schwassmann-Wachmann 3-AG	53839	0.6958	11.4076	198.7053	69.9590	0.9390	5.23
55	73P/Schwassmann-Wachmann 3-AH	53839	0.6934	11.3306	197.7396	70.7074	0.9430	5.21
56	73P/Schwassmann-Wachmann 3-AI	53839	0.6965	11.4179	198.7608	69.9381	0.9390	5.25
57	73P/Schwassmann-Wachmann 3-AJ	53839	0.8002	12.1493	196.7657	72.0623	0.9361	8.43
58	73P/Schwassmann-Wachmann 3-AK	53839	0.6934	11.4295	199.3257	69.3762	0.9377	5.18
59	73P/Schwassmann-Wachmann 3-AL	53839	0.6998	11.4439	198.7226	69.9798	0.9388	5.32
60	73P/Schwassmann-Wachmann 3-AM	53839	0.6934	11.5442	201.0886	68.1193	0.9309	5.14
61	73P/Schwassmann-Wachmann 3-AN	53839	0.6948	11.4051	198.8012	69.8916	0.9390	5.21
62	73P/Schwassmann-Wachmann 3-AO	53839	0.6938	11.3259	198.1672	70.3888	0.9408	5.2
63	73P/Schwassmann-Wachmann 3-AP	53856	0.7014	11.4659	198.7426	69.9670	0.9387	5.35
64	73P/Schwassmann-Wachmann 3-AQ	53856	0.6959	11.4137	198.7713	69.9207	0.9390	5.24
65	73P/Schwassmann-Wachmann 3-AR	53839	0.6958	11.4065	198.7098	69.9663	0.9392	5.24
66	73P/Schwassmann-Wachmann 3-AS	53839	0.6999	11.4507	198.7273	69.9676	0.9389	5.32
67	73P/Schwassmann-Wachmann 3-AT	53839	0.6869	11.3346	198.8104	69.8481	0.9396	5.06
68	73P/Schwassmann-Wachmann 3-AU	53839	0.6928	11.3822	198.7583	69.9145	0.9393	5.18
69	73P/Schwassmann-Wachmann 3-AV	53839	0.6934	11.3951	198.8335	69.8852	0.9390	5.19
70	73P/Schwassmann-Wachmann 3-AW	53839	0.6773	11.2396	198.8340	69.7945	0.9403	4.89
71	73P/Schwassmann-Wachmann 3-AX	53839	0.6925	11.4278	199.2513	69.4670	0.9380	5.16
72	73P/Schwassmann-Wachmann 3-AY	53839	0.6751	11.2259	198.9220	69.7115	0.9402	4.85
73	73P/Schwassmann-Wachmann 3-AZ	53839	0.6751	11.2207	198.8670	69.7643	0.9403	4.85
74	73P/Schwassmann-Wachmann 3-BA	53839	0.6824	11.2708	198.6920	69.9210	0.9402	4.98
75	73P/Schwassmann-Wachmann 3-BB	53839	0.6824	11.1902	197.9286	70.4709	0.9424	4.99

76	73P/Schwassmann-Wachmann 3-BC	53856	0.7005	11.4587	198.7461	69.9555	0.9388	5.33
77	73P/Schwassmann-Wachmann 3-BD	53839	0.6824	10.9745	196.4631	71.4185	0.9462	5.01
78	73P/Schwassmann-Wachmann 3-BE	53839	0.6824	11.3166	199.0041	69.6935	0.9394	4.98
79	73P/Schwassmann-Wachmann 3-BF	53856	0.6857	11.3220	198.8098	69.8346	0.9396	5.04
80	73P/Schwassmann-Wachmann 3-BG	53839	0.6848	11.3245	198.9548	69.7208	0.9393	5.02
81	73P/Schwassmann-Wachmann 3-BH	53839	0.6824	11.2894	198.8381	69.8039	0.9398	4.98
82	73P/Schwassmann-Wachmann 3-BI	53856	0.6825	11.3005	198.9128	69.7526	0.9398	4.98
83	73P/Schwassmann-Wachmann 3-BJ	53839	0.6911	11.3702	198.7979	69.8788	0.9393	5.14
84	73P/Schwassmann-Wachmann 3-BK	53839	0.6915	11.3708	198.7754	69.8975	0.9393	5.15
85	73P/Schwassmann-Wachmann 3-BL	53839	0.6962	11.4094	198.6994	69.9734	0.9391	5.24
86	73P/Schwassmann-Wachmann 3-BM	53839	0.6824	11.2943	198.8613	69.7756	0.9398	4.98
87	73P/Schwassmann-Wachmann 3-BN	53856	0.6918	11.3774	198.7948	69.8815	0.9392	5.15
88	73P/Schwassmann-Wachmann 3-BO	53856	0.6918	11.3762	198.7716	69.8920	0.9392	5.16
89	73P/Schwassmann-Wachmann 3-BP	53856	0.6825	11.2908	198.8488	69.8106	0.9398	4.98
90	73P/Schwassmann-Wachmann 3-BQ	53856	0.6925	11.3883	198.8198	69.8658	0.9392	5.17
91	73P/Schwassmann-Wachmann 3-BR	53856	0.6852	11.3192	198.8413	69.8267	0.9396	5.03
92	73P/Schwassmann-Wachmann 3-BS	53856	0.6986	11.4445	198.7685	69.9400	0.9389	5.29
93	79P/du Toit-Hartley	54587	0.5940	2.8933	253.2760	307.8379	1.2305	4.83
94	85P/Boethin	54252	0.7812	4.2953	37.6184	359.3961	1.1347	9.24
95	96P/Machholz 1	54205	0.9587	59.9551	14.6182	94.5506	0.1246	5.91
96	103P/Hartley 2	54771	0.6949	13.6175	181.2322	219.7741	1.0585	5.88
97	109P/Swift-Tuttle	50000	0.9632	113.4538	152.9822	139.3812	0.9595	51.22
98	122P/de Vico	50280	0.9627	85.3828	12.9961	79.6245	0.6593	34.7
99	141P/Machholz 2-A	53480	0.7501	12.7951	149.2844	246.1616	0.7528	5.27
100	141P/Machholz 2-D	51520	0.7511	12.8118	149.2918	246.1336	0.7490	5.27

101	161P/Hartley-IRAS	51612	0.8347	95.7659	47.1708	1.6160	1.2752	14.16
102	162P/Siding Spring	53331	0.5973	27.8448	356.3623	31.2526	1.2276	4.87
103	169P/NEAT	53618	0.7675	11.3190	217.9270	176.2461	0.6053	4.6
104	177P/Barnard	53262	0.9542	31.1617	60.2714	272.2915	1.1078	47.24
105	181P/Shoemaker-Levy 6	54091	0.7065	16.9267	333.5544	37.8721	1.1275	6.56
106	182P/LONEOS	52932	0.6666	16.9153	51.4027	75.1201	0.9772	4.88
107	185P/Petrieve	52470	0.6962	13.9457	181.8879	214.0933	0.9453	5.28
108	189P/NEAT	53624	0.5974	20.4015	15.2803	282.2087	1.1737	4.66
109	197P/LINEAR	53597	0.6297	25.5520	188.7394	66.3943	1.0619	4.67
110	206P/Barnard-Boattini	54514	0.6465	32.9309	181.4027	204.1562	1.1452	5.33
111	207P/NEAT	53341	0.7576	10.1501	271.2179	200.6825	0.9409	6.82
112	209P/LINEAR	53894	0.6894	19.1529	149.7130	66.4588	0.9125	4.96
113	210P/Christensen	53808	0.8284	10.1455	345.4511	93.9063	0.5482	5.84
114	217P/LINEAR	54353	0.6896	12.8809	246.8359	125.6422	1.2219	6.65
115	222P/LINEAR	54316	0.7266	5.1445	345.4224	7.1328	0.7814	4.93
116	225P/LINEAR	52644	0.6637	20.7096	1.3197	15.5023	1.1920	5.9
117	D/1766 G1 (Helfenzrieder)	-33800	0.8476	7.8650	178.6990	76.2630	0.4060	4.92
118	D/1770 L1 (Lexell)	-32236	0.7861	1.5517	225.0161	134.4673	0.6744	5.63
119	D/1819 W1 (Blanpain)	-14241	0.6988	9.1081	350.2612	79.8122	0.8923	5.03
120	C/1827 M1 (Pons-Gambart)	-11480	0.9458	136.4601	19.1895	320.0292	0.8065	28.97
121	D/1884 O1 (Barnard)	9320	0.5833	5.4701	301.0508	6.7602	1.2795	4.86
122	D/1894 F1 (Denning)	12880	0.6979	5.5274	46.3504	85.7329	1.1470	6.45
123	D/1895 Q1 (Swift)	13430	0.6520	2.9923	167.7817	171.7537	1.2978	6.16
124	C/1917 F1 (Mellish)	21333	0.9931	32.6828	121.3190	88.6683	0.1902	55.1
125	C/1921 H1 (Dubiago)	22800	0.9291	22.3265	97.4488	67.2065	1.1150	30.33

126	C/1937 D1 (Wilk)	28600	0.9811	26.0205	31.4751	58.2580	0.6189	64.87
127	C/1942 EA (Vaisala)	30405	0.9336	37.9961	335.2229	172.2906	1.2871	37.5
128	D/1978 R1 (Haneda-Campos)	43773	0.6652	5.9472	240.4619	132.2539	1.1014	5.48
129	C/1989 A3 (Bradfield)	47500	0.9777	83.0672	194.7353	28.4357	0.4203	37.29
130	C/1991 L3 (Levy)	48508	0.9288	19.1903	41.4693	329.4307	0.9825	26.62
131	P/1994 X1 (McNaught-Russell)	49721	0.8157	29.0742	171.1436	218.0113	1.2768	12.58
132	P/1999 R1 (SOHO)	53089	0.9774	13.6762	43.6897	4.9324	0.0570	4.99
133	P/1999 RO28 (LONEOS)	51443	0.6508	8.1911	219.8591	148.4502	1.2318	5.82
134	C/1999 X3 (SOHO)	53183	0.9816	6.3208	353.7090	323.5200	0.0480	5.18
135	P/2000 G1 (LINEAR)	51662	0.6721	10.3771	343.2941	191.0258	1.0029	5.11
136	C/2001 OG108 (LONEOS)	52258	0.9253	80.2450	116.4196	10.5553	0.9940	25.61
137	C/2001 W2 (BATTERS)	52248	0.9414	115.9131	142.0858	113.3559	1.0511	34.81
138	C/2002 R5 (SOHO)	53575	0.9853	14.1206	45.7238	13.2142	0.0474	6.38
139	P/2002 S7 (SOHO)	53188	0.9850	13.5825	52.0130	50.3070	0.0485	6.4
140	P/2003 O3 (LINEAR)	52881	0.5985	8.3645	0.7633	341.5008	1.2464	4.96
141	P/2004 R1 (McNaught)	53263	0.6823	4.8905	0.6031	296.0059	0.9885	5.23
142	P/2005 JQ5 (Catalina)	53526	0.6935	5.6956	222.6961	95.8627	0.8255	4.56
143	P/2005 T4 (SWAN)	53667	0.9305	160.0362	41.4449	25.4225	0.6494	18.04
144	P/2006 HR30 (Siding Spring)	54049	0.8431	31.8845	117.4138	309.9521	1.2264	14.41
145	P/2006 T1 (Levy)	54026	0.6721	18.3213	179.4495	279.8045	0.9895	5.05
146	P/2006 U1 (LINEAR)	54049	0.8161	8.4337	64.0410	240.6460	0.5106	5.04
147	P/2006 Y2 (Gibbs)	54126	0.5869	14.4711	26.3020	113.3541	1.2512	4.81
148	P/2007 T2 (Kowalski)	54417	0.7748	9.8952	358.5516	3.9948	0.6959	5.48
149	P/2008 S1 (McNaught)	54731	0.6664	15.1017	203.6311	111.3903	1.1902	5.95
150	P/2008 Y1 (Boattini)	54846	0.7349	8.8051	162.3644	259.7098	1.2720	8.32
151	P/2009 L2 (Yang-Gao)	55022	0.6209	16.1586	346.9544	259.3047	1.2961	5.54

Appendix C: Mission Planning Matlab Code

```
% Uriah Tobey
% Multiple Rendezvous of Near-Earth Objects using Earth Gravity Assist
% Version 0.85

% Matlab files needed to run this program: angl.m, constmath.m, days2mdh.m, findearth1.m,
% findasteroid1.m, findcomet1.m, findjupiter.m, findmars1.m, findmercury.m, findmoon1.m,
% findneptune.m, findpluto.m, findsaturn.m, finduranus.m, findvenus.m, gauss.m,
% invjday.m, jday.m, mag.m, newtonm.m, newtonnu.m, piter.m, rv2coe.m, tofp.m, univar.m,

% Excel files needed to run this program: Earth(06Dec09).xls, Full Asteroid
List(11Nov09).xls,
% Full Comet List(16Nov09).xls, Jupiter(06Dec09).xls, Mars(06Dec09).xls,
% Mercury(06Dec09).xls, Moon(06Dec09).xls, Neptune(06Dec09).xls, Pluto(06Dec09).xls,
% Saturn(06Dec09).xls, Uranus(06Dec09).xls, Venus(06Dec09).xls

% Image files needed to run this program: trajectory_geometry.tif,
% cover.jpeg, Figures.jpeg

% Recommend placing all of the above files in a single folder
% Click "Add to Path" for the folder's location when prompted by Matlab

clear all;
close all
clc;

% Constants from www.celestrak.com code
au          = 149597870.691;      % km
re          = 6378.137;          % km
masssun     = 1.9891e30;         % kg
massearth   = 5.9742e24;         % kg
mu          = 398600.4418;       % km3/s2
% Constants from http://www.planck.com/heliocentric.htm
musunm      = 1.32712440018e20;   % m3/s2
musunkm     = musunm/(1000^3);    % km3/s2
musunau     = 1;                 % DU3/TU2
TU2day      = 58.132821;         % Days
SUs         = 29.784852;         % km/s
SU          = 7.90536828;        % km/s

% Initial Setup
%-----
% Sets 3-D plot views
az = 60;    el = 60;
xlow = -3; xhi = 3;
ylow = -3; yhi = 3;
zlow = -1; zhi = 1;

Isp = 300;    % s
g0 = 9.8067;  % m/s^2
md = 500;    % kg

run_num = 1;

% Reads and displays cover page
cover = imread('cover.jpg');
image(cover); title('Asteroid Rendezvous Program (Images from NASA.gov) [Click red "X" to
continue]');
axis off

disp('Welcome to mission planning for performing multiple rendezvous')
disp('of near-Earth asteroids and/or comets. Please follow the')
disp('on-screen instructions. Press ENTER to continue.')
```

```

pause
clc;
close

% Reads and displays cover page
figures = imread('Figures.jpg');
image(figures); title('Figure to explain figures [Click red "X" to continue]');
axis off
disp('Press ENTER to continue.')
pause
clc;

% Reads and displays trajectory geometry options
geom_image = imread('trajectory_geometry.tif');
image(geom_image); title('Trajectory Geometry Options for going from Earth to Asteroid
[Click red "X" to continue]');
axis off

% Set intplot to 0 if you want to see the intermediate plots; set to 1 if
% you don't.
intplot = 1;

%Mission Analysis Choices
% Input 0 for "short way" or 1 for "long way" trajectory
iway = input('Enter 0 for "short way" or 1 for "long way" trajectory\n');
close

% % Select method of solution
disp('Recommend that if "short way" is chosen, use universal variables method.')
disp('Recommend that if "long way" is chosen, use p-iteration method.')
sol_method = input('Enter 0 for universal variables method or 1 for p-iteration
method\n');

%disp('Typical Characteristic velocity values for an asteroid visit are under 10 km/s')
delv_limit = 5; %input('Enter upper limit on Characteristic velocity in km/s for Asteroid
visit\n');
%disp('Typical transfer period tolerance values are between 1 and 5 days')
period_diff = 1; %input('Enter tolerance on transfer period from Earths period in
days\n');
%disp('Typical Velocity magnitude difference tolerance between Earth and Spacecraft is
0.0001')
vel_tol = .045; %input('Enter desired tolerance between Earth and Spacecraft at launch in
km/s\n');
proceed = 0; %input('Enter 0 if happy with choices and enter 1 if not.\n');

% IJK = Sun-centered/Heliocentric ecliptic reference plane
% ijk = Earth-centered geocentric reference plane

% Decide Launch Date
year_launch = input('Enter the launch year 2010-2025 (yyyy)\n');
month_launch = input('Enter the launch month # (mm NO leading 0 for single digits)\n');
day_launch = input('Enter the launch day (dd NO leading 0 for single digits)\n');
jd_launch = jday(year_launch, month_launch, day_launch, 0, 0, 0);
jdi = jd_launch;
jdf = jday(2025,12,31,0,0,0);
jdspread = jdf-jdi;
%-----
% Loops through mission analysis
mm = 1;
period_add = 0;
cont_prog = 0;
while cont_prog == 0;
clc;
close all
clearvars -except Ttran_days jd_launch year_launch month_launch day_launch rx1 ry1 rz1
vx1 vy1 vz1...

```

```

run_num mm az el xlow xhi ylow yhi zlow zhi iway sol_method delv_limit period_diff
vel_tol proceed...
au re masssun massearth mu musunm musunkm musunau TU2day SUs SU flyby ilowm vinfm
flybym delvm...
Tdiffm veldiffm jm Rxyzl_sc periodlm rxxl ryy1 rzz1 period_addm rxam ryam rzam
jdspread jdi jdf...
intplot g0 Isp md T_tran rxlm rylm rzlm vxlm vylm vzlm qm bm incm diffm

% Automatically finds arrival date based on parametric study of time of flight
jd_arrive = jd_launch + 366/2;
[year_arrive,month_arrive,day_arrive,hra,mina,seca] = invjday (jd_arrive);
if year_arrive > 2025
    disp('Outside of year range. Program terminating; press Enter.')
    pause
    return
end
if run_num >= 2
    disp('Earth Rendezvous: Year Month Day:')
    [year_launch month_launch day_launch]
end
disp('Arrival: Year Month Day:')
[year_arrive month_arrive day_arrive]

% Calculates the number of travel days, or Time of Flight (TOF)
tdays = jd_arrive-jd_launch;
sprintf('Total number of travel days: \n %0.5g', tdays)

% Finding Earth's initial position [COE's] => r1,v1
[eccenl,peridistl,inc1l,lanl,periargl,meanmol,meananoml,semimajl,apodistl,periodl,trueano
ml] = findearthl(year_launch,month_launch,day_launch);
pl = semimajl*(1-eccenl^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarl = pl/(1+eccenl*cosd(trueanoml)); % Scalar r in AU's (Wiesel pg. 65)
rvectorl = [rscalarl*cosd(trueanoml); rscalarl*sind(trueanoml); 0]; % Vector r in AU's
(Wiesel pg. 65)
Vvectorl = sqrt(musunau/pl)*[-sind(trueanoml); (eccenl+cosd(trueanoml)); 0]; % Velocity
vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatl = [cosd(lanl)*cosd(periargl)-sind(lanl)*sind(periargl)*cosd(inc1l) -
cosd(lanl)*sind(periargl)-sind(lanl)*cosd(periargl)*cosd(inc1l) sind(lanl)*sind(inc1l);
sind(lanl)*cosd(periargl)+cosd(lanl)*sind(periargl)*cosd(inc1l) -
sind(lanl)*sind(periargl)+cosd(lanl)*cosd(periargl)*cosd(inc1l) -cosd(lanl)*sind(inc1l);
sind(periargl)*sind(inc1l)
cosd(periargl)*sind(inc1l) cosd(inc1l)];
%disp('Earths position vector at launch:')
Rexyzl = RotMatl*rvectorl; % From ijk to IJK frame
%disp('Earths velocity vector at launch:')
Vexyzl = RotMatl*Vvectorl; % From ijk to IJK frame

% Finding the Moon's initial position [COE's] => r1,v1
[eccenml,peridistml,inc1ml,lanml,periargml,meanmoml,meananomml,semimajml,apodistml,period
ml,trueanomml] = findmoonl(year_launch,month_launch,day_launch);
pml = semimajml*(1-eccenml^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarml = pml/(1+eccenml*cosd(trueanomml)); % Scalar r in AU's (Wiesel pg. 65)
rvectorml = [rscalarml*cosd(trueanomml); rscalarml*sind(trueanomml); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectorml = sqrt(musunau/pml)*[-sind(trueanomml); (eccenml+cosd(trueanomml)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatml = [cosd(lanml)*cosd(periargml)-sind(lanml)*sind(periargml)*cosd(inc1ml) -
cosd(lanml)*sind(periargml)-sind(lanml)*cosd(periargml)*cosd(inc1ml)
sind(lanml)*sind(inc1ml);
sind(lanml)*cosd(periargml)+cosd(lanml)*sind(periargml)*cosd(inc1ml) -
sind(lanml)*sind(periargml)+cosd(lanml)*cosd(periargml)*cosd(inc1ml) -
cosd(lanml)*sind(inc1ml);
sind(periargml)*sind(inc1ml)
cosd(periargml)*sind(inc1ml) cosd(inc1ml)];
%disp('Moons position vector at launch:')
Rmxyzl = RotMatml*rvectorml; % From ijk to IJK frame

```

```

%disp('Moons velocity vector at launch:')
Vmxzy1 = RotMatml*Vvectorml; % From ijk to IJK frame

% Finding Earth's position at arrival of asteroid [COE's] => r2,v2
[eccena,peridista,incla,lanma,periarga,meanmoa,meananoma,semimaja,apodista,perioda,trueano
ma] = findearth1(year_arrive,month_arrive,day_arrive);
pa = semimaja*(1-eccena^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalara = pa/(1+eccena*cosd(trueanoma)); % Scalar r in AU's (Wiesel pg. 65)
rvectora = [rscalara*cosd(trueanoma); rscalara*sind(trueanoma); 0]; % Vector r in AU's
(Wiesel pg. 65)
Vvectora = sqrt(musunau/pa)*[-sind(trueanoma); (eccena+cosd(trueanoma)); 0]; % Velocity
vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMata = [cosd(lanma)*cosd(periargma)-sind(lanma)*sind(periargma)*cosd(inclma) -
cosd(lanma)*sind(periargma)-sind(lanma)*cosd(periargma)*cosd(inclma)  sind(lanma)*sind(inclma);
sind(lanma)*cosd(periargma)+cosd(lanma)*sind(periargma)*cosd(inclma) -
sind(lanma)*sind(periargma)+cosd(lanma)*cosd(periargma)*cosd(inclma) -
sind(lanma)*sind(inclma);
cosd(periargma)*sind(inclma) cosd(inclma)];
%disp('The Earths position vector at arrival:')
Rexyza = RotMata*rvectora; % From ijk to IJK frame
%disp('The Earths velocity vector at arrival:')
Vexyza = RotMata*Vvectora; % From ijk to IJK frame

% Finding Moon's position at arrival of asteroid [COE's] => r2,v2
[eccenma,peridistma,inclma,lanma,periargma,meanmoma,meananomma,semimajma,apodistma,period
ma,trueanomma] = findmoon1(year_arrive,month_arrive,day_arrive);
pma = semimajma*(1-eccenma^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarma = pma/(1+eccenma*cosd(trueanomma)); % Scalar r in AU's (Wiesel pg. 65)
rvectorma = [rscalarma*cosd(trueanomma); rscalarma*sind(trueanomma); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectorma = sqrt(musunau/pma)*[-sind(trueanomma); (eccenma+cosd(trueanomma)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatma = [cosd(lanma)*cosd(periargma)-sind(lanma)*sind(periargma)*cosd(inclma) -
cosd(lanma)*sind(periargma)-sind(lanma)*cosd(periargma)*cosd(inclma)
sind(lanma)*sind(inclma);
sind(lanma)*cosd(periargma)+cosd(lanma)*sind(periargma)*cosd(inclma) -
sind(lanma)*sind(periargma)+cosd(lanma)*cosd(periargma)*cosd(inclma) -
cosd(lanma)*sind(inclma);
sind(periargma)*sind(inclma)
cosd(periargma)*sind(inclma) cosd(inclma)];
%disp('The Moons position vector at arrival:')
Rmxyza = RotMatma*rvectorma; % From ijk to IJK frame
%disp('The Moons velocity vector at arrival:')
Vmxyza = RotMatma*Vvectorma; % From ijk to IJK frame

% Finding Mars's initial position [COE's] => r1,v1
[eccenal,peridistal,inclal,lanal,periargal,meanmoal,meananomal,semimajal,apodistal,period
al,trueanomal] = findmars1(year_launch,month_launch,day_launch);
pal = semimajal*(1-eccenal^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalaral = pal/(1+eccenal*cosd(trueanomal)); % Scalar r in AU's (Wiesel pg. 65)
rvectoral = [rscalaral*cosd(trueanomal); rscalaral*sind(trueanomal); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectoral = sqrt(musunau/pal)*[-sind(trueanomal); (eccenal+cosd(trueanomal)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatal = [cosd(lanlal)*cosd(periargal)-sind(lanlal)*sind(periargal)*cosd(inclal) -
cosd(lanlal)*sind(periargal)-sind(lanlal)*cosd(periargal)*cosd(inclal)
sind(lanlal)*sind(inclal);
sind(lanlal)*cosd(periargal)+cosd(lanlal)*sind(periargal)*cosd(inclal) -
sind(lanlal)*sind(periargal)+cosd(lanlal)*cosd(periargal)*cosd(inclal) -
cosd(lanlal)*sind(inclal);
sind(periargal)*sind(inclal)
cosd(periargal)*sind(inclal) cosd(inclal)];
%disp('Mars position vector at launch:')
Raxyzl = RotMatal*rvectoral; % From ijk to IJK frame
%disp('Mars velocity vector at launch:')

```

```

Vaxyz1 = RotMatal*Vvectoral; % From ijk to IJK frame

% Finding Mars's position at arrival of asteroid [COE's] => r2,v2
[eccenaa,peridistaa,inclaa,lanaa,periargaa,meanmoaa,meananomaa,semimajaa,apodistaa,period
aa,trueanomaa] = findmars1(year_arrive,month_arrive,day_arrive);
paa = semimajaa*(1-eccenaa^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalaraa = paa/(1+eccenaa*cosd(trueanomaa)); % Scalar r in AU's (Wiesel pg. 65)
rvectoraa = [rscalaraa*cosd(trueanomaa); rscalaraa*sind(trueanomaa); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectoraa = sqrt(musunau/paa)*[-sind(trueanomaa); (eccenaa*cosd(trueanomaa)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMataa = [cosd(lanaa)*cosd(periargaa)-sind(lanaa)*sind(periargaa)*cosd(inclaa) -
cosd(lanaa)*sind(periargaa)-sind(lanaa)*cosd(periargaa)*cosd(inclaa)
sind(lanaa)*sind(inclaa);
sind(lanaa)*cosd(periargaa)+cosd(lanaa)*sind(periargaa)*cosd(inclaa) -
sind(lanaa)*sind(periargaa)+cosd(lanaa)*cosd(periargaa)*cosd(inclaa) -
cosd(lanaa)*sind(inclaa);
sind(periargaa)*sind(inclaa)
cosd(periargaa)*sind(inclaa) cosd(inclaa)];
%disp('Mars position vector at arrival:')
Raxyza = RotMataa*rvectoraa; % From ijk to IJK frame
%disp('Mars velocity vector at arrival:')
Vaxyza = RotMataa*Vvectoraa; % From ijk to IJK frame

% Finds the locations of all catalogued Near-Earth Asteroids
% (NEA's) for the chosen launch and arrival dates
[Obj_names1,Rxyzxl,Rxyzyl,Rxyzzl, Vxyzxl,Vxyzyl,Vxyzzl] = findasteroid1(year_launch,
month_launch, day_launch);
[Obj_namesa,Rxyzxa,Rxyzya,Rxyzza, Vxyzxa,Vxyzya,Vxyzza] = findasteroid1(year_arrive,
month_arrive, day_arrive);

% Finds the locations of all Near-Earth Comets
% (NEC's) for the chosen launch and arrival dates
[Com_names1,Rcxyzxl,Rcxyzyl,Rcxyzzl, Vcxyzxl,Vcxyzyl,Vcxyzzl] = findcomet1(year_launch,
month_launch, day_launch);
[Com_namesa,Rcxyzxa,Rcxyzya,Rcxyzza, Vcxyzxa,Vcxyzya,Vcxyzza] = findcomet1(year_arrive,
month_arrive, day_arrive);

if run_num == 1
% Finding the Satellite speed at Earth's Sphere of Influence
Rsoi = au*(massearth/masssun)^(2/5); % Earth's sphere of influence radius. Curtis book
pg. 441
h_sc = 185; %Rsoi;
vcirc = sqrt(mu/(re+h_sc))*1000; % Velocity of satellite in circular orbit in
m/s
format long g
% Finding the Satellite's position at launch [COE's] => r1,v1
mue = 1;
inc_sc = 28.5;
ecc_sc = 0;
semimaj_sc = (re + h_sc)/re;
lan_sc = 40;
periarg_sc = 0;
p_sc = (re + h_sc)/re;
meanmot_sc = sqrt(mue/(semimaj_sc^3));
trueanom_sc = 0;
rpgw_sc =
[(p_sc*cosd(trueanom_sc))/(1+ecc_sc*cosd(trueanom_sc));(p_sc*sind(trueanom_sc))/(1+ecc_sc
*cosd(trueanom_sc));0];
vpqw_sc = [-sqrt(mue/p_sc)*sin(trueanom_sc);sqrt(mue/p_sc)*(ecc_sc*cosd(trueanom_sc));0];
RotMat_sc = [cosd(lan_sc)*cosd(periarg_sc)-sind(lan_sc)*sind(periarg_sc)*cosd(inc_sc) -
cosd(lan_sc)*sind(periarg_sc)-sind(lan_sc)*cosd(periarg_sc)*cosd(inc_sc)
sind(lan_sc)*sind(inc_sc);
sind(lan_sc)*cosd(periarg_sc)+cosd(lan_sc)*sind(periarg_sc)*cosd(inc_sc) -
sind(lan_sc)*sind(periarg_sc)+cosd(lan_sc)*cosd(periarg_sc)*cosd(inc_sc) -
cosd(lan_sc)*sind(inc_sc);

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        sind(periarg_sc)*sind(inc_sc)
cosd(periarg_sc)*sind(inc_sc)                                cosd(inc_sc)];
rijk_sc = RotMat_sc*rpqw_sc;
vijk_sc = RotMat_sc*vpqw_sc;
Rxyzl_sc = (Rxyzl+rijk_sc*(re/au)).';
Vxyzl_sc = (Vxyzl+vijk_sc*(SU/SUs)).';

% Finding Mercury's initial position [COE's] => r1,v1
[eccencl,peridistcl,inclcl,lancl,periargcl,meanmoccl,meananomcl,semimajcl,apodistcl,period
cl,trueanomcl] = findmercury(year_launch,month_launch,day_launch);
pcl = semimajcl*(1-eccencl^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarcl = pcl/(1+eccencl*cosd(trueanomcl)); % Scalar r in AU's (Wiesel pg. 65)
rvectorcl = [rscalarcl*cosd(trueanomcl); rscalarcl*sind(trueanomcl); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectorcl = sqrt(musunau/pcl)*[-sind(trueanomcl); (eccencl+cosd(trueanomcl)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatcl = [cosd(lancl)*cosd(periargcl)-sind(lancl)*sind(periargcl)*cosd(inclcl) -
cosd(lancl)*sind(periargcl)-sind(lancl)*cosd(periargcl)*cosd(inclcl)
sind(lancl)*sind(inclcl);
        sind(lancl)*cosd(periargcl)+cosd(lancl)*sind(periargcl)*cosd(inclcl) -
sind(lancl)*sind(periargcl)+cosd(lancl)*cosd(periargcl)*cosd(inclcl) -
cosd(lancl)*sind(inclcl);
        sind(periargcl)*sind(inclcl)
cosd(periargcl)*sind(inclcl)                                cosd(inclcl)];
%disp('Mercurys position vector at launch:')
Rxyzcl = RotMatcl*rvectorcl; % From ijk to IJK frame
%disp('Mercurys velocity vector at launch:')
Vxyzcl = RotMatcl*Vvectorcl; % From ijk to IJK frame

% Finding Venus's initial position [COE's] => r1,v1
[eccenvl,peridistvl,inclvl,lanvl,periargvl,meanmovl,meananomvl,semimajvl,apodistvl,period
vl,trueanomvl] = findvenus(year_launch,month_launch,day_launch);
pvl = semimajvl*(1-eccenvl^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarvl = pvl/(1+eccenvl*cosd(trueanomvl)); % Scalar r in AU's (Wiesel pg. 65)
rvectorvl = [rscalarvl*cosd(trueanomvl); rscalarvl*sind(trueanomvl); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectorvl = sqrt(musunau/pvl)*[-sind(trueanomvl); (eccenvl+cosd(trueanomvl)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatvl = [cosd(lanvl)*cosd(periargvl)-sind(lanvl)*sind(periargvl)*cosd(inclvl) -
cosd(lanvl)*sind(periargvl)-sind(lanvl)*cosd(periargvl)*cosd(inclvl)
sind(lanvl)*sind(inclvl);
        sind(lanvl)*cosd(periargvl)+cosd(lanvl)*sind(periargvl)*cosd(inclvl) -
sind(lanvl)*sind(periargvl)+cosd(lanvl)*cosd(periargvl)*cosd(inclvl) -
cosd(lanvl)*sind(inclvl);
        sind(periargvl)*sind(inclvl)
cosd(periargvl)*sind(inclvl)                                cosd(inclvl)];
%disp('Venus position vector at launch:')
Rxyzvl = RotMatvl*rvectorvl; % From ijk to IJK frame
%disp('Venus velocity vector at launch:')
Vxyzvl = RotMatvl*Vvectorvl; % From ijk to IJK frame

% Finding Jupiter's initial position [COE's] => r1,v1
[eccenjl,peridistjl,incljl,lanjl,periargjl,meanmojl,meananomjl,semimajjl,apodistjl,period
jl,trueanomjl] = findjupiter(year_launch,month_launch,day_launch);
pjl = semimajjl*(1-eccenjl^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarjl = pjl/(1+eccenjl*cosd(trueanomjl)); % Scalar r in AU's (Wiesel pg. 65)
rvectorjl = [rscalarjl*cosd(trueanomjl); rscalarjl*sind(trueanomjl); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectorjl = sqrt(musunau/pjl)*[-sind(trueanomjl); (eccenjl+cosd(trueanomjl)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatjl = [cosd(lanjl)*cosd(periargjl)-sind(lanjl)*sind(periargjl)*cosd(incljl) -
cosd(lanjl)*sind(periargjl)-sind(lanjl)*cosd(periargjl)*cosd(incljl)
sind(lanjl)*sind(incljl);

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        sind(lanj1)*cosd(periargj1)+cosd(lanj1)*sind(periargj1)*cosd(inclj1) -
sind(lanj1)*sind(periargj1)+cosd(lanj1)*cosd(periargj1)*cosd(inclj1) -
cosd(lanj1)*sind(inclj1);
        sind(periargj1)*sind(inclj1)
cosd(periargj1)*sind(inclj1)                                cosd(inclj1)];
%disp('Jupiters position vector at launch:')
Rexyzj1 = RotMatj1*rvectorj1; % From ijk to IJK frame
%disp('Jupiters velocity vector at launch:')
Vexyzj1 = RotMatj1*Vvectorj1; % From ijk to IJK frame

% Finding Saturn's initial position [COE's] => r1,v1
[eccensl,peridistsl,inclsl,lansl,periargsl,meanmosl,meananomsl,semimajsl,apodistsl,period
sl,trueanomsl] = findsaturn(year_launch,month_launch,day_launch);
psl = semimajsl*(1-eccensl^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarsl = psl/(1+eccensl*cosd(trueanomsl)); % Scalar r in AU's (Wiesel pg. 65)
rvectorsl = [rscalarsl*cosd(trueanomsl); rscalarsl*sind(trueanomsl); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectorsl = sqrt(musunau/psl)*[-sind(trueanomsl); (eccensl+cosd(trueanomsl)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatsl = [cosd(lansl)*cosd(periargsl)-sind(lansl)*sind(periargsl)*cosd(inclsl) -
cosd(lansl)*sind(periargsl)-sind(lansl)*cosd(periargsl)*cosd(inclsl)
sind(lansl)*sind(inclsl);
        sind(lansl)*cosd(periargsl)+cosd(lansl)*sind(periargsl)*cosd(inclsl) -
sind(lansl)*sind(periargsl)+cosd(lansl)*cosd(periargsl)*cosd(inclsl) -
cosd(lansl)*sind(inclsl);
        sind(periargsl)*sind(inclsl)
cosd(periargsl)*sind(inclsl)                                cosd(inclsl)];
%disp('Saturns position vector at launch:')
Rexyzsl = RotMatsl*rvectorsl; % From ijk to IJK frame
%disp('Saturns velocity vector at launch:')
Vexyzsl = RotMatsl*Vvectorsl; % From ijk to IJK frame

% Finding Uranus's initial position [COE's] => r1,v1
[eccenul,peridistul,inclul,lanul,periargul,meanmoul,meananomul,semimajul,apodistul,period
ul,trueanomul] = finduranus(year_launch,month_launch,day_launch);
pul = semimajul*(1-eccenul^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarul = pul/(1+eccenul*cosd(trueanomul)); % Scalar r in AU's (Wiesel pg. 65)
rvectorul = [rscalarul*cosd(trueanomul); rscalarul*sind(trueanomul); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectorul = sqrt(musunau/pul)*[-sind(trueanomul); (eccenul+cosd(trueanomul)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatul = [cosd(lanul)*cosd(periargul)-sind(lanul)*sind(periargul)*cosd(inclul) -
cosd(lanul)*sind(periargul)-sind(lanul)*cosd(periargul)*cosd(inclul)
sind(lanul)*sind(inclul);
        sind(lanul)*cosd(periargul)+cosd(lanul)*sind(periargul)*cosd(inclul) -
sind(lanul)*sind(periargul)+cosd(lanul)*cosd(periargul)*cosd(inclul) -
cosd(lanul)*sind(inclul);
        sind(periargul)*sind(inclul)
cosd(periargul)*sind(inclul)                                cosd(inclul)];
%disp('Uranus position vector at launch:')
Rexyzul = RotMatul*rvectorul; % From ijk to IJK frame
%disp('Uranus velocity vector at launch:')
Vexyzul = RotMatul*Vvectorul; % From ijk to IJK frame

% Finding Neptune's initial position [COE's] => r1,v1
[eccennl,peridistnl,inclnl,lannl,periargnl,meanmonl,meananomnl,semimajnl,apodistnl,period
nl,trueanomnl] = findneptune(year_launch,month_launch,day_launch);
pnl = semimajnl*(1-eccennl^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarnl = pnl/(1+eccennl*cosd(trueanomnl)); % Scalar r in AU's (Wiesel pg. 65)
rvectornl = [rscalarnl*cosd(trueanomnl); rscalarnl*sind(trueanomnl); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectornl = sqrt(musunau/pnl)*[-sind(trueanomnl); (eccennl+cosd(trueanomnl)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK

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RotMatn1 = [cosd(lann1)*cosd(periargn1)-sind(lann1)*sind(periargn1)*cosd(incln1) -
cosd(lann1)*sind(periargn1)-sind(lann1)*cosd(periargn1)*cosd(incln1)
sind(lann1)*sind(incln1);
            sind(lann1)*cosd(periargn1)+cosd(lann1)*sind(periargn1)*cosd(incln1) -
sind(lann1)*sind(periargn1)+cosd(lann1)*cosd(periargn1)*cosd(incln1) -
cosd(lann1)*sind(incln1);
            sind(periargn1)*sind(incln1)
cosd(periargn1)*sind(incln1)                                cosd(incln1)];
%disp('Neptunes position vector at launch:')
Rexyzn1 = RotMatn1*rvectorn1; % From ijk to IJK frame
%disp('Neptunes velocity vector at launch:')
Vexyzn1 = RotMatn1*Vvectorn1; % From ijk to IJK frame

% Finding Pluto's initial position [COE's] => r1,v1
[eccenpl,peridistpl,inclpl,lanpl,periargpl,meanmopl,meananompl,semimajpl,apodistpl,period
pl,trueanompl] = findpluto(year_launch,month_launch,day_launch);
ppl = semimajpl*(1-eccenpl^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarpl = ppl/(1+eccenpl*cosd(trueanompl)); % Scalar r in AU's (Wiesel pg. 65)
rvectorpl = [rscalarpl*cosd(trueanompl); rscalarpl*sind(trueanompl); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectorpl = sqrt(musunau/ppl)*[-sind(trueanompl); (eccenpl+cosd(trueanompl)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatpl = [cosd(lanpl)*cosd(periargpl)-sind(lanpl)*sind(periargpl)*cosd(inclpl) -
cosd(lanpl)*sind(periargpl)-sind(lanpl)*cosd(periargpl)*cosd(inclpl)
sind(lanpl)*sind(inclpl);
            sind(lanpl)*cosd(periargpl)+cosd(lanpl)*sind(periargpl)*cosd(inclpl) -
sind(lanpl)*sind(periargpl)+cosd(lanpl)*cosd(periargpl)*cosd(inclpl) -
cosd(lanpl)*sind(inclpl);
            sind(periargpl)*sind(inclpl)
cosd(periargpl)*sind(inclpl)                                cosd(inclpl)];
%disp('Plutos position vector at launch:')
Rexyzpl = RotMatpl*rvectorpl; % From ijk to IJK frame
%disp('Plutos velocity vector at launch:')
Vexyzpl = RotMatpl*Vvectorpl; % From ijk to IJK frame

%-----
% Planets at Arrival
% Finding Mercury's position at arrival of asteroid [COE's] => r2,v2
[eccenca,peridistca,inclca,lanca,periargca,meanmoca,meananomca,semimajca,apodistca,period
ca,trueanomca] = findmercury(year_launch,month_launch,day_launch);
pca = semimajca*(1-eccenca^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarca = pca/(1+eccenca*cosd(trueanomca)); % Scalar r in AU's (Wiesel pg. 65)
rvectorca = [rscalarca*cosd(trueanomca); rscalarca*sind(trueanomca); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectorca = sqrt(musunau/pca)*[-sind(trueanomca); (eccenca+cosd(trueanomca)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatca = [cosd(lanca)*cosd(periargca)-sind(lanca)*sind(periargca)*cosd(inclca) -
cosd(lanca)*sind(periargca)-sind(lanca)*cosd(periargca)*cosd(inclca)
sind(lanca)*sind(inclca);
            sind(lanca)*cosd(periargca)+cosd(lanca)*sind(periargca)*cosd(inclca) -
sind(lanca)*sind(periargca)+cosd(lanca)*cosd(periargca)*cosd(inclca) -
cosd(lanca)*sind(inclca);
            sind(periargca)*sind(inclca)
cosd(periargca)*sind(inclca)                                cosd(inclca)];
%disp('Mercurys position vector at arrival:')
Rexyzca = RotMatca*rvectorca; % From ijk to IJK frame
%disp('Mercurys velocity vector at arrival:')
Vexyzca = RotMatca*Vvectorca; % From ijk to IJK frame

% Finding Venus's position at arrival of asteroid [COE's] => r2,v2
[eccenva,peridistva,inclva,lanva,periargva,meanmova,meananomva,semimajva,apodistva,period
va,trueanomva] = findvenus(year_launch,month_launch,day_launch);
pva = semimajva*(1-eccenva^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarva = pva/(1+eccenva*cosd(trueanomva)); % Scalar r in AU's (Wiesel pg. 65)
rvectorva = [rscalarva*cosd(trueanomva); rscalarva*sind(trueanomva); 0]; % Vector r in
AU's (Wiesel pg. 65)

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Vvectorva = sqrt(musunau/pva)*[-sind(trueanomva); (eccenva+cosd(trueanomva)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatva = [cosd(lanva)*cosd(periargva)-sind(lanva)*sind(periargva)*cosd(inclva) -
cosd(lanva)*sind(periargva)-sind(lanva)*cosd(periargva)*cosd(inclva)
sind(lanva)*sind(inclva);
sind(lanva)*cosd(periargva)+cosd(lanva)*sind(periargva)*cosd(inclva) -
sind(lanva)*sind(periargva)+cosd(lanva)*cosd(periargva)*cosd(inclva) -
cosd(lanva)*sind(inclva);
sind(periargva)*sind(inclva)
cosd(periargva)*sind(inclva) cosd(inclva)];
%disp('Venus position vector at arrival:')
Rexyzva = RotMatva*rvectorva; % From ijk to IJK frame
%disp('Venus velocity vector at arrival:')
Vexyzva = RotMatva*Vvectorva; % From ijk to IJK frame

% Finding Jupiter's position at arrival of asteroid [COE's] => r2,v2
[eccenja,peridistja,inclja,lanja,periargja,meanmoja,meananomja,semimajja,apodistja,period
ja,trueanomja] = findjupiter(year_launch,month_launch,day_launch);
pja = semimajja*(1-eccenja^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarja = pja/(1+eccenja*cosd(trueanomja)); % Scalar r in AU's (Wiesel pg. 65)
rvectorja = [rscalarja*cosd(trueanomja); rscalarja*sind(trueanomja); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectorja = sqrt(musunau/pja)*[-sind(trueanomja); (eccenja+cosd(trueanomja)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatja = [cosd(lanja)*cosd(periargja)-sind(lanja)*sind(periargja)*cosd(inclja) -
cosd(lanja)*sind(periargja)-sind(lanja)*cosd(periargja)*cosd(inclja)
sind(lanja)*sind(inclja);
sind(lanja)*cosd(periargja)+cosd(lanja)*sind(periargja)*cosd(inclja) -
sind(lanja)*sind(periargja)+cosd(lanja)*cosd(periargja)*cosd(inclja) -
cosd(lanja)*sind(inclja);
sind(periargja)*sind(inclja)
cosd(periargja)*sind(inclja) cosd(inclja)];
%disp('Jupiters position vector at arrival:')
Rexyzja = RotMatja*rvectorja; % From ijk to IJK frame
%disp('Jupiters velocity vector at arrival:')
Vexyzja = RotMatja*Vvectorja; % From ijk to IJK frame

% Finding Saturn's position at arrival of asteroid [COE's] => r2,v2
[eccensa,peridistsa,inclsa,lansa,periargsa,meanmosa,meananomsa,semimajsa,apodistsa,period
sa,trueanomsa] = findsaturn(year_launch,month_launch,day_launch);
psa = semimajsa*(1-eccensa^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarsa = psa/(1+eccensa*cosd(trueanomsa)); % Scalar r in AU's (Wiesel pg. 65)
rvectorsa = [rscalarsa*cosd(trueanomsa); rscalarsa*sind(trueanomsa); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectorsa = sqrt(musunau/psa)*[-sind(trueanomsa); (eccensa+cosd(trueanomsa)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatsa = [cosd(lansa)*cosd(periargsa)-sind(lansa)*sind(periargsa)*cosd(inclsa) -
cosd(lansa)*sind(periargsa)-sind(lansa)*cosd(periargsa)*cosd(inclsa)
sind(lansa)*sind(inclsa);
sind(lansa)*cosd(periargsa)+cosd(lansa)*sind(periargsa)*cosd(inclsa) -
sind(lansa)*sind(periargsa)+cosd(lansa)*cosd(periargsa)*cosd(inclsa) -
cosd(lansa)*sind(inclsa);
sind(periargsa)*sind(inclsa)
cosd(periargsa)*sind(inclsa) cosd(inclsa)];
%disp('Saturns position vector at arrival:')
Rexyzsa = RotMatsa*rvectorsa; % From ijk to IJK frame
%disp('Saturns velocity vector at arrival:')
Vexyzsa = RotMatsa*Vvectorsa; % From ijk to IJK frame

% Finding Uranus's position at arrival of asteroid [COE's] => r2,v2
[eccenua,peridistua,inclua,lanua,periargua,meanmoua,meananomua,semimajua,apodistua,period
ua,trueanomua] = finduranus(year_launch,month_launch,day_launch);
pua = semimajua*(1-eccenua^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarua = pua/(1+eccenua*cosd(trueanomua)); % Scalar r in AU's (Wiesel pg. 65)

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rvectorua = [rscalarua*cosd(trueanomua); rscalarua*sind(trueanomua); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectorua = sqrt(musunau/pua)*[-sind(trueanomua); (eccenua*cosd(trueanomua)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatua = [cosd(lanua)*cosd(periargua)-sind(lanua)*sind(periargua)*cosd(inclua) -
cosd(lanua)*sind(periargua)-sind(lanua)*cosd(periargua)*cosd(inclua)
sind(lanua)*sind(inclua);
sind(lanua)*cosd(periargua)+cosd(lanua)*sind(periargua)*cosd(inclua) -
sind(lanua)*sind(periargua)+cosd(lanua)*cosd(periargua)*cosd(inclua) -
cosd(lanua)*sind(inclua);
sind(periargua)*sind(inclua)
cosd(periargua)*sind(inclua) cosd(inclua)];
%disp('Uranus position vector at arrival:')
Rexyzua = RotMatua*rvectorua; % From ijk to IJK frame
%disp('Uranus velocity vector at arrival:')
Vexyzua = RotMatua*Vvectorua; % From ijk to IJK frame

% Finding Neptune's position at arrival of asteroid [COE's] => r2,v2
[eccenna,peridistna,inclna,lanna,periargna,meanmona,meananomna,semimajna,apodistna,period
na,trueanomna] = findneptune(year_launch,month_launch,day_launch);
pna = semimajna*(1-eccenna^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarna = pna/(1+eccenna*cosd(trueanomna)); % Scalar r in AU's (Wiesel pg. 65)
rvectorna = [rscalarna*cosd(trueanomna); rscalarna*sind(trueanomna); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectorna = sqrt(musunau/pna)*[-sind(trueanomna); (eccenna*cosd(trueanomna)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatna = [cosd(lanna)*cosd(periargna)-sind(lanna)*sind(periargna)*cosd(inclna) -
cosd(lanna)*sind(periargna)-sind(lanna)*cosd(periargna)*cosd(inclna)
sind(lanna)*sind(inclna);
sind(lanna)*cosd(periargna)+cosd(lanna)*sind(periargna)*cosd(inclna) -
sind(lanna)*sind(periargna)+cosd(lanna)*cosd(periargna)*cosd(inclna) -
cosd(lanna)*sind(inclna);
sind(periargna)*sind(inclna)
cosd(periargna)*sind(inclna) cosd(inclna)];
%disp('Neptunes position vector at arrival:')
Rexyzna = RotMatna*rvectorna; % From ijk to IJK frame
%disp('Neptunes velocity vector at arrival:')
Vexyzna = RotMatna*Vvectorna; % From ijk to IJK frame

% Finding Pluto's position at arrival of asteroid [COE's] => r2,v2
[eccenpa,peridistpa,inclpa,lanpa,periargpa,meanmopa,meananompa,semimajpa,apodistpa,period
pa,trueanompa] = findpluto(year_launch,month_launch,day_launch);
ppa = semimajpa*(1-eccenpa^2); % Semi-latus Rectum in AU's (Sidi pg. 16)
rscalarpa = ppa/(1+eccenpa*cosd(trueanompa)); % Scalar r in AU's (Wiesel pg. 65)
rvectorpa = [rscalarpa*cosd(trueanompa); rscalarpa*sind(trueanompa); 0]; % Vector r in
AU's (Wiesel pg. 65)
Vvectorpa = sqrt(musunau/ppa)*[-sind(trueanompa); (eccenpa*cosd(trueanompa)); 0]; %
Velocity vector in AU's/day (Wiesel pg. 66)
% Rotation matrix to go from ijk to IJK
RotMatpa = [cosd(lanpa)*cosd(periargpa)-sind(lanpa)*sind(periargpa)*cosd(inclpa) -
cosd(lanpa)*sind(periargpa)-sind(lanpa)*cosd(periargpa)*cosd(inclpa)
sind(lanpa)*sind(inclpa);
sind(lanpa)*cosd(periargpa)+cosd(lanpa)*sind(periargpa)*cosd(inclpa) -
sind(lanpa)*sind(periargpa)+cosd(lanpa)*cosd(periargpa)*cosd(inclpa) -
cosd(lanpa)*sind(inclpa);
sind(periargpa)*sind(inclpa)
cosd(periargpa)*sind(inclpa) cosd(inclpa)];
%disp('Plutos position vector at arrival:')
Rexyzpa = RotMatpa*rvectorpa; % From ijk to IJK frame
%disp('Plutos velocity vector at arrival:')
Vexyzpa = RotMatpa*Vvectorpa; % From ijk to IJK frame

%-----
% Plots of solar system and objects of interest at launch date
% y=yellow m=magenta c=cyan r=red g=green b=blue w=white k=black
% Marker Type + o * . x 'square' or s 'diamond' or d ^ v > < 'pentagram' or

```

```

% p 'hexagram' or h
% Plots the location of all planets and the Earth/SC at launch
ssxmin = -2; ssxmax = 2; ssymin = -2; ssymax = 2; sszmin = -1; sszmax = 1;
ssaz = 60; ssel = 60;
scatter3(0,0,0,100,'y','filled'),view(az,el),axis([ssxmin ssxmax ssymin ssymax sszmin
sszmax])
hold on
scatter3(Rexyzcl(1),Rexyzcl(2),Rexyzcl(3),'.','m'),view(ssaz,ssel),axis([ssxmin ssxmax
ssymin ssymax sszmin sszmax])
hold on
scatter3(Rexyzvl(1),Rexyzvl(2),Rexyzvl(3),'+','c'),view(ssaz,ssel),axis([ssxmin ssxmax
ssymin ssymax sszmin sszmax])
hold on
scatter3(Rxyzl_sc(1),Rxyzl_sc(2),Rxyzl_sc(3),50,'g','filled'),view(ssaz,ssel),axis([ssxmi
n ssxmax ssymin ssymax sszmin sszmax])
hold on
scatter3(Rmxyzl(1),Rmxyzl(2),Rmxyzl(3),20,'k','filled'),view(ssaz,ssel),axis([ssxmin
ssxmax ssymin ssymax sszmin sszmax])
hold on
scatter3(Raxyzl(1),Raxyzl(2),Raxyzl(3),35,'r','filled'),view(ssaz,ssel),axis([ssxmin
ssxmax ssymin ssymax sszmin sszmax])
% Create title
title({'Locations of interior planets, Earth/SC, and Mars at launch [Click red "X" to
continue]'});
% Create legend
legend('Sun','Mercury','Venus','Earth/SC','Moon','Mars','Location','BestOutside')
hold off

% Plots of solar system and objects of interest at launch date
% y=yellow m=magenta c=cyan r=red g=green b=blue w=white k=black
% Marker Type + o * . x 'square' or s 'diamond' or d ^ v > < 'pentagram' or
% p 'hexagram' or h
% Plots the location of all planets and the Earth/SC at launch
figure
ssxmin = -20; ssxmax = 20; ssymin = -20; ssymax = 20; sszmin = -1; sszmax = 1;
ssaz = 60; ssel = 60;
scatter3(0,0,0,100,'y','filled'),view(az,el),axis([ssxmin ssxmax ssymin ssymax sszmin
sszmax])
hold on
scatter3(Rexyzjl(1),Rexyzjl(2),Rexyzjl(3),'p','m'),view(ssaz,ssel),axis([ssxmin ssxmax
ssymin ssymax sszmin sszmax])
hold on
scatter3(Rexyzsl(1),Rexyzsl(2),Rexyzsl(3),'d','c'),view(ssaz,ssel),axis([ssxmin ssxmax
ssymin ssymax sszmin sszmax])
hold on
scatter3(Rexyzul(1),Rexyzul(2),Rexyzul(3),'s','g'),view(ssaz,ssel),axis([ssxmin ssxmax
ssymin ssymax sszmin sszmax])
hold on
scatter3(Rexyznl(1),Rexyznl(2),Rexyznl(3),'h','k'),view(ssaz,ssel),axis([ssxmin ssxmax
ssymin ssymax sszmin sszmax])
hold on
scatter3(Rexyzpl(1),Rexyzpl(2),Rexyzpl(3),'*','r'),view(ssaz,ssel),axis([ssxmin ssxmax
ssymin ssymax sszmin sszmax])
% Create title
title({'Locations of outer planets at launch [Click red "X" to continue]'});
% Create legend
legend('Sun','Jupiter','Saturn','Uranus','Neptune','Pluto','Location','BestOutside')
hold off

%-----
% Finding Asteroid Solutions

flyby1 = 0; %input('Enter 0 to flyby the object or enter 1 to rendezvous.\n');
if flyby1 > 0
    flyby = 1;
else flyby = 0;
end

```

```

solution = 0;
k = 1;
k1 = 1;
i = 1;
count_vel = 0;
count_T_diff = 0;
delv_lim = delv_limit/SUs;
while i<=length(Rxyzxa)
    if sol_method == 0
        [nsoln,v1,v2] = univar(Rxyzl_sc,[Rxyzxa(i),Rxyzya(i),Rxyzza(i)],tdays,iway,0);
    else if sol_method == 1
        [nsoln,v1,v2] = piter(Rxyzl_sc,[Rxyzxa(i),Rxyzya(i),Rxyzza(i)],tdays,iway,0);
    end
end
if nsoln == 1;
    delv1 = mag(v1) - mag(Vxyzl_sc.);
    delv2 = sqrt((Vxyzxa(i)-v2(1))^2+(Vxyzya(i)-v2(2))^2+(Vxyzza(i)-v2(3))^2);
    delv = delv1+ delv2*flyby;
    if delv <= delv_lim
        vel_diff = mag(v1)-mag(Vexyzl);
        if abs(vel_diff) < vel_tol
            count_vel = count_vel + 1;
            [p,a,ecc,incl,omega,argp,nu,m,arglat,truelon,lonper] =
rv2coe(Rxyzl_sc,v1,musunau);
            Vinf = v1 - Vexyzl;
            Vinf_mag = mag(Vinf)*SUs;
            if flyby == 0;
                flyby_sp = delv2;
                flyby_mag = abs(flyby_sp*SUs);
            end
            T = 2*pi*sqrt((a^3)/musunau);
            T_days = T*TU2day;
            Trat = periodl/T_days;
            T_diff = 365-T_days;
            if abs(T_diff) < period_diff
                count_T_diff = count_T_diff + 1;
                J(k1) = (Vinf_mag + flyby_mag + 5*abs(delv*SUs) + 5*abs(T_diff))/12;
                if J(k1) <= min(J)
                    J_low = J(k1);
                    ilow = i;
                    Vinf_mag_low = Vinf_mag;
                    flyby_mag_low = flyby_mag;
                    delv_low = delv;
                    T_days_low = T_days;
                    T_diff_low = T_diff;
                    vel_diff_low = vel_diff;
                    % disp('Vector of: [Object #: Hyperbolic Excess Speed; Flyby
Speed; Characteristic Velocity Required]')
                    % disp('[Difference between periods; Velocity Difference; Period;
J-score]')
                    % [ilow, Vinf_mag_low, flyby_mag_low, abs(delv_low*SUs),
T_diff_low, abs(vel_diff_low*SUs), T_days, J_low].
                    k1 = k1 + 1;
                end
            end
        end
    end
    Rxa(k) = Rxyzxa(i);
    Rya(k) = Rxyzya(i);
    Rza(k) = Rxyzza(i);
    k = k+1;
end
i = i+1;
end
%disp('Asteroid Solutions')
disp('Total number of solutions with velocity differences within tolerance:')
count_vel
disp('Total number of these solutions with period differences also within
tolerance:')

```

```

count_T_diff
if ilow == 0
    disp('Program could not find a solution for this date; terminating operation.')
    return
end
if ilow > 1
    disp('Best Object to visit: [Object #]')
    ilow % = input('Enter the object # for the desired object number to visit.\n');
    disp('Vector of: [Hyperbolic Excess Speed; Flyby Speed; Characteristic Velocity
Required]')
    disp('[Difference between periods; Velocity Difference; Period; J-score]')
    [Vinf_mag_low, flyby_mag_low, abs(delv_low*SUs), T_diff_low, abs(vel_diff_low*SUs),
T_days_low, J_low]. =
    ilowm(run_num) = ilow;
    vinfm(run_num) = Vinf_mag_low;
    flybym(run_num) = flyby_mag_low;
    delvm(run_num) = abs(delv_low*SUs);
    Tdiffm(run_num) = T_diff_low;
    veldiffm(run_num) = abs(vel_diff_low*SUs);
    jm(run_num) = J_low;
end

%-----
% % Finding Comet Solutions
%
% solution = 0;
% k = 1;
% k1 = 1;
% i = 1;
% iclow = 1;
% count_vel = 0;
% count_T_diff = 0;
% delv_lim = delv_limit/SUs;
% while i<=length(Rcxyzxa)
%     if sol_method == 0
%         [nsoln,v1,v2] =
univar(Rxyzl_sc,[Rcxyzxa(i),Rcxyzza(i),Rcxyzza(i)],tdays,iway,0);
%     else if sol_method == 1
%         [nsoln,v1,v2] =
piter(Rxyzl_sc,[Rcxyzxa(i),Rcxyzza(i),Rcxyzza(i)],tdays,iway,0);
%     end
% end
%     if nsoln == 1;
%         delv1 = mag(v1) - mag(Vxyzl_sc.);
%         delv2 = sqrt((Vxyzxa(i)-v2(1))^2+(Vxyzza(i)-v2(2))^2+(Vxyzza(i)-v2(3))^2);
%mag([Vcxyzxa(i);Vcxyzza(i);Vcxyzza(i)]) - mag(v2);
%         delv = delv1+ delv2*flyby;
%         if delv <= delv_lim
%             vel_diff = mag(v1)-mag(Vexyzl);
%             if abs(vel_diff) < vel_tol
%                 count_vel = count_vel + 1;
%                 [p,a,ecc,incl,omega,argp,nu,m,arglat,truelon,lonper] =
rv2coe(Rxyzl_sc,v1,musunau);
%                 Vinf = v1 - Vexyzl;
%                 Vinf_mag = mag(Vinf)*SUs;
%                 if flyby == 0;
%                     flyby_sp = delv2;
%                     flyby_mag = abs(flyby_sp*SUs);
%                 end
%                 T = 2*pi*sqrt((a^3)/musunau);
%                 T_days = T*TU2day;
%                 Trat = periodl/T_days;
%                 T_diff = (1-Trat)*periodl;
%                 if abs(T_diff) < period_diff
%                     count_T_diff = count_T_diff + 1;
%                     J(k1) = (Vinf_mag + flyby_mag + 5*abs(delv*SUs) +
5*abs(T_diff))/12;
%                     if J(k1) <= min(J)
%                         Jc_low = J(k1);
%                         iclow = i;

```



```

        count_vel = count_vel + 1;
        Vinf = v1 - Vexyz1;
        Vinf_mag = mag(Vinf)*SUs;
        if flyby == 0;
            flyby_sp = delv2;
            flyby_mag = abs(flyby_sp*SUs);
        end
        J(k1) = (Vinf_mag + flyby_mag + 5*abs(delv*SUs) + 5*abs(T_diff))/12;
        if J(k1) <= min(J)
            J_low = J(k1);
            ilow = i;
            Vinf_mag_low = Vinf_mag;
            flyby_mag_low = flyby_mag;
            delv_low = delv;
            T_days_low = T_days;
            T_diff_low = T_diff;
            vel_diff_low = vel_diff;
            vlm = v1;
            % disp('Vector of: [Object #: Hyperbolic Excess Speed; Flyby
Speed; Characteristic Velocity Required]')
            % disp('[Difference between periods; Velocity Difference; Period;
J-score]')
            [ilow, Vinf_mag_low, flyby_mag_low, abs(delv_low*SUs),
T_diff_low, abs(vel_diff_low*SUs), T_days, J_low].'
            k1 = k1 + 1;
        end
    end
    %end
    end
    Rxa(k) = Rxyzxa(i);
    Rya(k) = Rxyzya(i);
    Rza(k) = Rxyzza(i);
    k = k+1;
end
i = i+1;
end
%disp('Asteroid Solutions')
disp('Total number of solutions with velocity differences within tolerance:')
count_vel
disp('Total number of these solutions with period differences also within
tolerance:')
count_T_diff
if ilow == 0
    disp('Program could not find a solution for this date; terminating operation.')
    return
end
if ilow > 1
    disp('Best Object to visit: [Object #]')
    ilow % = input('Enter the object # for the desired object number to visit.\n');
    disp('Vector of: [Hyperbolic Excess Speed; Flyby Speed; Characteristic Velocity
Required]')
    disp('[Difference between periods; Velocity Difference; Period; J-score]')
    [Vinf_mag_low, flyby_mag_low, abs(delv_low*SUs), T_diff_low, abs(vel_diff_low*SUs),
T_days_low, J_low].'
    ilowm(run_num) = ilow;
    vinfm(run_num) = Vinf_mag_low;
    flybym(run_num) = flyby_mag_low;
    delvm(run_num) = abs(delv_low*SUs);
    Tdiffm(run_num) = T_diff_low;
    veldiffm(run_num) = abs(vel_diff_low*SUs);
    jm(run_num) = J_low;
end
end

% if run_num >= 2;
% q = tdays + 170;
% while q <= T_tran*TU2day - 1
%     vinf1x(q) = vx1(q) - Vexyz1(1);
%     vinf1y(q) = vy1(q) - Vexyz1(2);

```

```

%   vinflz(q) = vz1(q)- Vexyzl(3);
%   inc = 0;
%   while inc <= 360*(pi/180);
%       t =
cross([vx1(q),vy1(q),vz1(q)],[0,0,1])/mag(cross([vx1(q),vy1(q),vz1(q)],[0,0,1]));
%       s = cross(t,[vx1(q),vy1(q),vz1(q)])/mag(cross(t,[vx1(q),vy1(q),vz1(q)]));
%       n = -t*sin(inc)+s*cos(inc);
%       b = 5*re/au;
%       while b < 200*re/au
%           vinf = mag([vinflx(q),vinfly(q),vinflz(q)]);
%           e = sqrt(1+(b^4)*(vinf^4)/musunau^2);
%           nuinf = acos(-1/e);
%           d = 2*nuinf - pi;
%           vinf2 = cos(d)*[vinflx(q),vinfly(q),vinflz(q)]+(1-
cos(d))*(dot(n,[vinflx(q),vinfly(q),vinflz(q)]))*n+sin(d)*cross(n,[vinflx(q),vinfly(q),vi
nflz(q)]));
%           v2a = Vexyzl.' + vinf2;
%           diff = v2a - vlm.';
%           diff1 = mag(diff);
%           diff2 = mag(v2a) - mag(vlm);
%           if abs(diff2) < vel_tol*100
%               disp(['q; b in Earth radii; inclination in degrees, |Velocity
difference|'])
%               [q b*(au/re) inc*(180/pi) abs(diff1)]
%               qm(run_num) = q;
%               bm(run_num) = b*(au/re);
%               incm(run_num) = inc*(180/pi);
%               diffm(run_num) = abs(diff1);
%               b = 200*re/au;
%               inc = 360*(pi/180);
%               q = T_tran*TU2day - 1;
%           end
%       b = b + 1*re/au;
%   end
%   inc = inc + 1*(pi/180);
% end
% q = q+1
% end
% end

if run_num == 1;
% Plots the location of all NEA's, NEC's, the sun, the Moon, Mars, and the Earth/SC at
launch
% y=yellow m=magenta c=cyan r=red g=green b=blue w=white k=black
% Marker Type + o * . x 'square' or s 'diamond' or d ^ v > < 'pentagram' or p 'hexagram'
or h
figure
scatter3(Rxyzxl,Rxyzyl,Rxyzzl, '.', 'm'),view(az,el),axis([xlow xhi ylow yhi zlow zhi])
hold on
scatter3(Rcxyzxl,Rcxyzyl,Rcxyzzl, '+', 'c'),view(az,el),axis([xlow xhi ylow yhi zlow zhi])
hold on
scatter3(0,0,0,100, 'y', 'filled'),view(az,el),axis([xlow xhi ylow yhi zlow zhi])
hold on
scatter3(Rxyzl_sc(1),Rxyzl_sc(2),Rxyzl_sc(3),50, 's', 'g', 'filled'),view(az,el),axis([xlow
xhi ylow yhi zlow zhi])
hold on
scatter3(Rmxyzl(1),Rmxyzl(2),Rmxyzl(3),20, 'v', 'k', 'filled'),view(az,el),axis([xlow xhi
ylow yhi zlow zhi])
hold on
scatter3(Raxyzl(1),Raxyzl(2),Raxyzl(3),35, 'o', 'r', 'filled'),view(az,el),axis([xlow xhi
ylow yhi zlow zhi])
% Create title
title({'Locations of NEAs, NECs, Sun, Moon, Mars, and Earth/SC on launch date [Click red
"X" and press enter to continue]'});
% Create legend
legend('Asteroids at Launch', 'Comets at Launch', 'Sun', 'Earth/SC at Launch', 'Moon at
Launch', 'Mars at Launch', 'Location', 'BestOutside')
hold off

```

```

% Plots objects of interest at arrival date
% Plots the location of all NEA's, NEC's, the sun, and the Earth/SC for the chosen
arrival date
% y=yellow m=magenta c=cyan r=red g=green b=blue w=white k=black
% Marker Type + o * . x 'square' or s 'diamond' or d ^ v > < 'pentagram' or p 'hexagram'
or h
figure
scatter3(Rxa,Rya,Rza,','','r'),view(az,el),axis([xlow xhi ylow yhi zlow zhi])
hold on
% scatter3(Rcxa,Rcya,Rcza,+',','k'),view(az,el),axis([xlow xhi ylow yhi zlow zhi])
% hold on
scatter3(0,0,0,100,'y','filled'),view(az,el),axis([xlow xhi ylow yhi zlow zhi])
hold on
scatter3(Rexya(1),Rexya(2),Rexya(3),50,'s','b','filled'),view(az,el),axis([xlow xhi
ylow yhi zlow zhi])
hold on
scatter3(Rmxya(1),Rmxya(2),Rmxya(3),50,'v','m','filled'),view(az,el),axis([xlow xhi
ylow yhi zlow zhi])
hold on
scatter3(Raxyza(1),Raxyza(2),Raxyza(3),50,'o','c','filled'),view(az,el),axis([xlow xhi
ylow yhi zlow zhi])
% Create title
title({'Locations of NEAs, NECs, Sun, Moon, Mars, and Earth/SC on arrival date [Click red
"X" to continue]'});
% Create legend
legend('Asteroids at Arrival','Sun','Earth/SC at Arrival','Moon at Arrival','Mars at
Arrival','Location','BestOutside')
hold off
% disp('Press ENTER to continue.')
% pause
end

%-----
% Asteroid Selection
%astOrcom = 0; %input('Type 0 to go to an Asteroid. Type 1 to go to a Comet.\n');

%if astOrcom == 0;

% Prompts user to pick the desired object from the low-energy solutions
obj = ilow; %input('Enter the desired object number to visit\n');

% Section finds the position and velocity vectors of the chosen object
h_obj =
cross([Rxyzxl(obj),Rxyzyl(obj),Rxyzzl(obj)], [Vxyzxl(obj),Vxyzyl(obj),Vxyzzl(obj)]);
e_obj1 = (1/musunau)*(cross([Vxyzxl(obj),Vxyzyl(obj),Vxyzzl(obj)],h_obj)-
(musunau*[Rxyzxl(obj),Rxyzyl(obj),Rxyzzl(obj)])/mag([Rxyzxl(obj),Rxyzyl(obj),Rxyzzl(obj)]
)));
[p_obj,a_obj,e_obj,i_obj,lan_obj,argper_obj,nu0_obj,m_obj,arglat,truelon,lonper ] =
rv2coe
([Rxyzxl(obj),Rxyzyl(obj),Rxyzzl(obj)], [Vxyzxl(obj),Vxyzyl(obj),Vxyzzl(obj)], musunau);

% Finds the energy of the objects orbit and its orbital period
en_obj = 0.5*(mag([Vxyzxl(obj),Vxyzyl(obj),Vxyzzl(obj)])^2)-
(musunau/mag([Rxyzxl(obj),Rxyzyl(obj),Rxyzzl(obj)]));
T_obj = 2*pi*sqrt((a_obj^3)/musunau);
Tobj_days = T_obj*TU2day;

% Finds the eccentric anomaly of the object
ec_obj0 = 2*atan(sqrt((1-e_obj)/(1+e_obj))*tan(nu0_obj/2));

% Finds the time since perigee passage for the object
delta_ta = (ec_obj0-e_obj*sin(ec_obj0))/sqrt(musunau/a_obj^3);

% Finds the objects perifocal p,q,w unit vectors and rotation matrix to go from perifocal
to inertial sun-centered frame
pa = e_obj1/e_obj;
wa = h_obj/mag(h_obj);

```

```

ga = cross(wa,pa);
RotMata = [pa.',ga.',wa.'];

% Loop finds the object's positions and velocities for each day from launch to arrival
k = 1;
i = 0;
n = sqrt(musunau/(a_obj^3));
p = (a_obj*(1-e_obj^2));
c1 = sqrt(musunau/p_obj);
while i <= tdays/TU2day
    m_obj = n*(delta_ta + (i));
    [e0,nu] = newtonm(e_obj,m_obj);
    rscala = p/(1+e_obj*cos(nu));
    rvecta = rscala*[cos(nu),sin(nu),0];
    vvecta = c1*[-sin(nu),(e_obj+cos(nu)),0];
    ra = RotMata*rvecta.';
    va = RotMata*vvecta.';
    rxa(k) = ra(1);
    rya(k) = ra(2);
    rza(k) = ra(3);
    vxa(k) = va(1);
    vya(k) = va(2);
    vza(k) = va(3);
    i = i+0.01;
    k = k+1;
end
k = k-1;
rxa_obj = rxa(k);
rya_obj = rya(k);
rza_obj = rza(k);
rxam(run_num) = rxa_obj;
ryam(run_num) = rya_obj;
rzam(run_num) = rza_obj;
%-----

% Section outputs the velocity delta required to rendezvous with the first asteroid
if run_num > 1
    Rxyzl_sc = [rx1m,ry1m,rz1m];
    %Vxyzl_sc = v2a_low; % may have to add a .' here
end
if sol_method == 0
    [nsoln,v1,v2] = univar(Rxyzl_sc,[rxa_obj,rya_obj,rza_obj],tdays,iway,0);
else if sol_method == 1
    [nsoln,v1,v2] = piter(Rxyzl_sc,[rxa_obj,rya_obj,rza_obj],tdays,iway,0);
end
end
delv1_obj1 = mag(v1) - mag(Vxyzl_sc.' );
delv2_obj1 = sqrt((vxa(k)-v2(1))^2+(vya(k)-v2(2))^2+(vza(k)-v2(3))^2);
delv_obj1 = delv1_obj1 + delv2_obj1*flyby;
Rx1_obj1 = Rxyzxl(obj);
Ry1_obj1 = Rxyzyl(obj);
Rz1_obj1 = Rxyzzl(obj);

% Section finds the position and velocity vectors for the transfer orbit
htran = cross(Rxyzl_sc,v1);
etran1 = (1/musunau)*(cross(v1,htran)-(musunau*Rxyzl_sc)/mag(Rxyzl_sc));
[ptran,atran,etran,itrans,lantran,argpertran,nu0,mtran,arglat,truelon,lonper ] = rv2coe
(Rxyzl_sc,v1,musunau);

% Calculates the energy and orbital period for the transfer orbit
etran = 0.5*(mag(v1)^2)-(musunau/mag(Rxyzl_sc));
Ttran = 2*pi*sqrt((atran^3)/musunau);
Ttran_days = Ttran*TU2day;

% Calculates the energy and orbital period for the transfer orbit
etran = 0.5*(mag(v1)^2)-(musunau/mag(Rxyzl_sc));
Ttran = 2*pi*sqrt((atran^3)/musunau);
Ttran_days = Ttran*TU2day;

```

```

% Finds the eccentric anomaly for the transfer orbit (used to find the true anomaly)
ectran0 = 2*atan(sqrt((1-etrans)/(1+etrans))*tan(nu0/2));

% Finds the time since perigee passage for the transfer orbit and its perigee distance
delta_t = (ectran0-etrans*sin(ectran0))/sqrt(musunau/atran^3);

% Finds the transfer orbits perifocal p,q,w unit vectors and rotation matrix to go from
perifocal to inertial sun-centered frame
p = etran1/etrans;
w = htran/mag(htran);
q = cross(w,p);
RotMat = [p.',q.',w.'];

% % Finds the eccentricity vector for the transfer orbit
% k = 1;
% i = 0;
% while i <= rptran
%     eccenvectx(k) = etran1(1)*i/etrans;
%     eccenvecty(k) = etran1(2)*i/etrans;
%     eccenvectz(k) = etran1(3)*i/etrans;
%     i = i+0.001;
%     k = k+1;
% end

% Loop finds the transfer orbit's positions for each day of the period
k = 1;
i = 0;
n = sqrt(musunau/(atran^3));
p_tran = atran*(1-etrans^2);
c1 = sqrt(musunau/p_tran);
while i <= Ttran
    mtran = n*(delta_t + (i));
    [e0,nu] = newtonm (etrans,mtran);
    rscal = p_tran/(1+etrans*cos(nu));
    rvect = rscal*[cos(nu),sin(nu),0];
    vvect = c1*[-sin(nu),(etrans+cos(nu)),0];
    r = RotMat*rvect.';
    v = RotMat*vvect.';
    rx1(k) = r(1);
    ry1(k) = r(2);
    rz1(k) = r(3);
    rxx1(mm) = r(1);
    ryy1(mm) = r(2);
    rzz1(mm) = r(3);
    vx1(k) = v(1);
    vy1(k) = v(2);
    vz1(k) = v(3);
    i = i+0.01;
    k = k+1;
    mm = mm + 1;
end

% Loop parses out only transfer values from that found above
i = 0;
k = 1;
while i <= tdays/TU2day
    rx(k) = rx1(k);
    ry(k) = ry1(k);
    rz(k) = rz1(k);
    vx(k) = vx1(k);
    vy(k) = vy1(k);
    vz(k) = vz1(k);
    i = i+0.01;
    k = k+1;
end

%-----
% Section finds the position and velocity vectors for Earth's orbit

```

```

% Finds the eccentric anomaly for Earth's orbit
ec0 = 2*atan(sqrt((1-eccen1)/(1+eccen1))*tand(trueanom1/2));

% Finds the time since perigee passage for the transfer orbit and its perigee distance
delta_t = (ec0-eccen1*sin(ec0))/sqrt(musunau/semimaj1^3);

% Loop finds the Earth's position for each day of its period
k = 1;
i = 0;
ne = sqrt(musunau/(semimaj1^3));
c1 = sqrt(musunau/pl);
while i <= period1/TU2day
    me = ne*(delta_t + (i));
    [e0,nu] = newtonm (eccen1,me);
    rscal = pl/(1+eccen1*cos(nu));
    rvect = rscal*[cos(nu),sin(nu),0];
    vvect = c1*[-sin(nu),(eccen1+cos(nu)),0];
    r = RotMat1*rvect.';
    v = RotMat1*vvect.';
    rxel(k) = r(1);
    ryel(k) = r(2);
    rzel(k) = r(3);
    vxel(k) = v(1);
    vyel(k) = v(2);
    vzel(k) = v(3);
    i = i+0.01;
    k = k+1;
end

% Loop parses out only transfer values from that found above
i = 0;
k = 1;
while i <= tdays/TU2day
    rxel(k) = rxel(k);
    ryel(k) = ryel(k);
    rzel(k) = rzel(k);
    vxel(k) = vxel(k);
    vyel(k) = vyel(k);
    vzel(k) = vzel(k);
    i = i+0.01;
    k = k+1;
end
k = k-1;
Rexyza = [rxel(k),ryel(k),rzel(k)];

%-----
if run_num == 1
% Final Plot
% y=yellow m=magenta c=cyan r=red g=green b=blue w=white k=black
% Marker Type + o * . x 'square' or s 'diamond' or d ^ v > < 'pentagram' or p 'hexagram'
or h
figure
%scatter3(eccenvectx,eccenvecty,eccenvectz,1,'c','filled'),view(az,el),axis([xlow xhi
ylow yhi zlow zhi])
%hold on
scatter3(rx.',ry.',rz.',1,'k'),view(az,el),axis([xlow xhi ylow yhi zlow zhi])
hold on
scatter3(rxa.',rya.',rza.',1,'m'),view(az,el),axis([xlow xhi ylow yhi zlow zhi])
hold on
scatter3(rxa_obj,rya_obj,rza_obj,30,'xr'),view(az,el),axis([xlow xhi ylow yhi zlow zhi])
hold on
scatter3(Rxl_obj1,Ryl_obj1,Rzl_obj1,30,'sm','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
scatter3(0,0,0,100,'y','filled'),view(az,el),axis([xlow xhi ylow yhi zlow zhi])
hold on
scatter3(rxe.',rye.',rze.',1,'c','filled'),view(az,el),axis([xlow xhi ylow yhi zlow zhi])

```

```

hold on
scatter3(Rxyzl_sc(1),Rxyzl_sc(2),Rxyzl_sc(3),50,'pg','filled'),view(az,el),axis([xlow xhi
ylo w yhi zlow zhi])
hold on
scatter3(Rexyza(1),Rexyza(2),Rexyza(3),50,'hb','filled'),view(az,el),axis([xlow xhi ylo w
yhi zlow zhi])
% Create title
title({'Locations and trajectories of objects of interest [Click red "X" to continue]'});
% Create legend
legend('Transfer Trajectory','Targets Trajectory','Target at Arrival','Target at
Launch'...
,'Sun','Earths Trajectory','Earth/SC at Launch','Earth/SC at
Arrival','Location','BestOutside')
hold off
if intplot == 0
    disp('Press ENTER to continue.')
    pause
    close
end
end

if run_num >= 2
% Final Plot
% y=yellow m=magenta c=cyan r=red g=green b=blue w=white k=black
% Marker Type + o * . x 'square' or s 'diamond' or d ^ v > < 'pentagram' or p 'hexagram'
or h
figure
%scatter3(eccenvectx,eccenvecty,eccenvectz,1,'c','filled'),view(az,el),axis([xlow xhi
ylo w yhi zlow zhi])
%hold on
scatter3(rx.',ry.',rz.',1,'k'),view(az,el),axis([xlow xhi ylo w yhi zlow zhi])
hold on
scatter3(rxa.',rya.',rza.',1,'m'),view(az,el),axis([xlow xhi ylo w yhi zlow zhi])
hold on
scatter3(rxa_obj,rya_obj,rza_obj,30,'xr'),view(az,el),axis([xlow xhi ylo w yhi zlow zhi])
hold on
scatter3(Rxl_obj1,Ryl_obj1,Rzl_obj1,30,'sm','filled'),view(az,el),axis([xlow xhi ylo w yhi
zlow zhi])
hold on
scatter3(0,0,0,100,'y','filled'),view(az,el),axis([xlow xhi ylo w yhi zlow zhi])
hold on
scatter3(rxe.',rye.',rze.',1,'c','filled'),view(az,el),axis([xlow xhi ylo w yhi zlow zhi])
hold on
scatter3(Rxyzl(1),Rxyzl(2),Rxyzl(3),50,'pg','filled'),view(az,el),axis([xlow xhi ylo w
yhi zlow zhi])
hold on
scatter3(Rexyza(1),Rexyza(2),Rexyza(3),50,'hb','filled'),view(az,el),axis([xlow xhi ylo w
yhi zlow zhi])
% Create title
title({'Locations and trajectories of objects of interest [Click red "X" to continue]'});
% Create legend
legend('Transfer Trajectory','Targets Trajectory','Target at Arrival','Target at
Launch'...
,'Sun','Earths Trajectory','Earth/SC at Launch','Earth/SC at
Arrival','Location','BestOutside')
hold off
if intplot == 0
    disp('Press ENTER to continue.')
    pause
    close
end
end

%-----
% Finding follow-on objects
cont_prog = 0; %input('Enter 0 to continue program or 1 to end\n');
obs = round(jdspread/365);
if run_num >= obs;
    cont_prog = 1;

```

```

end
periodlm(run_num) = periodl;
if cont_prog == 0;
    period_add = T_days_low;
    period_addm(run_num) = T_days_low;
    jd_launch = jd_launch + fix(period_add);
    [year_launch,month_launch,day_launch,hr1,min1,sec1] = invjday ( jd_launch );
    rxlm = rx1(fix(Ttran/.01));
    rylm = ry1(fix(Ttran/.01));
    rzlm = rz1(fix(Ttran/.01));
    vxlm = vx1(fix(Ttran/.01));
    vylm = vy1(fix(Ttran/.01));
    vzlm = vz1(fix(Ttran/.01));
    run_num = run_num + 1;
end

end

disp('Total number of objects visited:')
length(ilowm)
disp('Vector of object numbers of objects visited:')
ilowm.'
% disp('Vector of transfer periods: [days]')
% period_addm.'
% disp('Vector of velocity differences: [m/s]')
% veldiffm.*1000
disp('Vector of characteristic velocities required: [m/s]')
delvm.*1000
disp('Total characteristic velocity required: [m/s]')
sum(delvm)*1000
disp('Vector of fuel expended for maneuvers: [kg]')
md*(exp((delvm*1000)/(Isp*g0))-1).'
disp('Total fuel expended for all maneuvers: [kg]')
sum(md*(exp((delvm*1000)/(Isp*g0))-1))
disp('Vector of hyperbolic excess speeds: [km/s]')
vinfm.'
disp('Vector of flyby speeds: [km/s]')
flybym.'
% disp('Vector of period differences:')
% Tdiffm.'
% disp('Vector of Earth periods:')
% periodlm.'
disp('Vector of J-scores:')
jm.'
disp('Total J-Score:')
sum(jm)
if length(ilowm) >= 16
    if sum(delvm)*1000 < 1500
        if sum(jm) < 20
            disp('You have chosen an initial launch date that results in an optimal
solution.')
            [optyear,optmonth,optday,ohr,omin,os] = invjday(jdi);
            disp('Optimal launch date: [Year Month Day]')
            [optyear, optmonth, optday]
        end
    end
end

end
disp('q Vector')
% qm.'
% disp('b Vector in Earth radii')
% bm.'
% disp('i Vector in degrees')
% incm.'
% disp('Velocity difference Vector')
% diffm.'

leg = 0;
final_plot = 0; %input('Enter 0 to show final plot or 1 not to\n');

```



```

close
if final_plot == 0
% Final Plot
% y=yellow m=magenta c=cyan r=red g=green b=blue w=white k=black
% Marker Type + o * . x 'square' or s 'diamond' or d ^ v > < 'pentagram' or p 'hexagram'
or h
figure
scatter3(rxxl.',ryyl.',rzzl.',1,'k'),view(az,el),axis([xlow xhi ylow yhi zlow zhi])
hold on
scatter3(0,0,0,100,'y','filled'),view(az,el),axis([xlow xhi ylow yhi zlow zhi])
hold on
scatter3(Rxyzl_sc(1),Rxyzl_sc(2),Rxyzl_sc(3),50,'pg','filled'),view(az,el),axis([xlow xhi
ylow yhi zlow zhi])
hold on
scatter3(Rexyza(1),Rexyza(2),Rexyza(3),50,'pb','filled'),view(az,el),axis([xlow xhi ylow
yhi zlow zhi])
hold on
if obs >= 1
scatter3(rxam(1),ryam(1),rzam(1),20,'sr','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
end
if obs >= 2
scatter3(rxam(2),ryam(2),rzam(2),20,'sc','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
end
if obs >= 3
scatter3(rxam(3),ryam(3),rzam(3),20,'sm','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
end
if obs >= 4
scatter3(rxam(4),ryam(4),rzam(4),20,'sg','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
end
if obs >= 5
scatter3(rxam(5),ryam(5),rzam(5),20,'vr','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
end
if obs >= 6
scatter3(rxam(6),ryam(6),rzam(6),20,'vc','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
end
if obs >= 7
scatter3(rxam(7),ryam(7),rzam(7),20,'vm','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
end
if obs >= 8
scatter3(rxam(8),ryam(8),rzam(8),20,'vg','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
end
if obs >= 9
scatter3(rxam(9),ryam(9),rzam(9),20,'hr','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
end
if obs >= 10
scatter3(rxam(10),ryam(10),rzam(10),20,'hc','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
end
if obs >= 11

```

```

scatter3(rxam(11),ryam(11),rzam(11),20,'hm','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
end
if obs >= 12
scatter3(rxam(12),ryam(12),rzam(12),20,'hg','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
end
if obs >= 13
scatter3(rxam(13),ryam(13),rzam(13),20,'dr','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
end
if obs >= 14
scatter3(rxam(14),ryam(14),rzam(14),20,'dc','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
end
if obs >= 15
scatter3(rxam(15),ryam(15),rzam(15),20,'dm','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
end
if obs >= 16
scatter3(rxam(16),ryam(16),rzam(16),20,'dg','filled'),view(az,el),axis([xlow xhi ylow yhi
zlow zhi])
hold on
end
% Create title
title({'Locations and trajectories of objects of interest [Click red "X" to continue]'});
% Create legend
while leg == 0;
if obs >= 1
legend('Spacecrafts Trajectory','Sun','Earth at Launch','Earth at Arrival','Object 1
Visited','Location','BestOutside')
leg = 1;
end
if obs >= 2
legend('Spacecrafts Trajectory','Sun','Earth at Launch','Earth at Arrival','Object 1
Visited'...
,'Object 2 Visited','Location','BestOutside')
leg = 1;
end
if obs >= 3
legend('Spacecrafts Trajectory','Sun','Earth at Launch','Earth at Arrival','Object 1
Visited'...
,'Object 2 Visited','Object 3 Visited','Location','BestOutside')
leg = 1;
end
if obs >= 4
legend('Spacecrafts Trajectory','Sun','Earth at Launch','Earth at Arrival','Object 1
Visited'...
,'Object 2 Visited','Object 3 Visited','Object 4 Visited','Location','BestOutside')
leg = 1;
end
if obs >= 5
legend('Spacecrafts Trajectory','Sun','Earth at Launch','Earth at Arrival','Object 1
Visited'...
,'Object 2 Visited','Object 3 Visited','Object 4 Visited','Object 5
Visited','Location','BestOutside')
leg = 1;
end
if obs >= 6
legend('Spacecrafts Trajectory','Sun','Earth at Launch','Earth at Arrival','Object 1
Visited'...
,'Object 2 Visited','Object 3 Visited','Object 4 Visited','Object 5 Visited','Object 6
Visited','Location','BestOutside')
leg = 1;
end

```

```

end
if obs >= 7
legend('Spacecrafts Trajectory','Sun','Earth at Launch','Earth at Arrival','Object 1
Visited'...
,'Object 2 Visited','Object 3 Visited','Object 4 Visited','Object 5 Visited','Object 6
Visited'...
,'Object 7 Visited','Location','BestOutside')
leg = 1;
end
if obs >= 8
legend('Spacecrafts Trajectory','Sun','Earth at Launch','Earth at Arrival','Object 1
Visited'...
,'Object 2 Visited','Object 3 Visited','Object 4 Visited','Object 5 Visited','Object 6
Visited'...
,'Object 7 Visited','Object 8 Visited','Location','BestOutside')
leg = 1;
end
if obs >= 9
legend('Spacecrafts Trajectory','Sun','Earth at Launch','Earth at Arrival','Object 1
Visited'...
,'Object 2 Visited','Object 3 Visited','Object 4 Visited','Object 5 Visited','Object 6
Visited'...
,'Object 7 Visited','Object 8 Visited','Object 9 Visited','Location','BestOutside')
leg = 1;
end
if obs >= 10
legend('Spacecrafts Trajectory','Sun','Earth at Launch','Earth at Arrival','Object 1
Visited'...
,'Object 2 Visited','Object 3 Visited','Object 4 Visited','Object 5 Visited','Object 6
Visited'...
,'Object 7 Visited','Object 8 Visited','Object 9 Visited','Object 10
Visited','Location','BestOutside')
leg = 1;
end
if obs >= 11
legend('Spacecrafts Trajectory','Sun','Earth at Launch','Earth at Arrival','Object 1
Visited'...
,'Object 2 Visited','Object 3 Visited','Object 4 Visited','Object 5 Visited','Object 6
Visited'...
,'Object 7 Visited','Object 8 Visited','Object 9 Visited','Object 10 Visited','Object 11
Visited','Location','BestOutside')
leg = 1;
end
if obs >= 12
legend('Spacecrafts Trajectory','Sun','Earth at Launch','Earth at Arrival','Object 1
Visited'...
,'Object 2 Visited','Object 3 Visited','Object 4 Visited','Object 5 Visited','Object 6
Visited'...
,'Object 7 Visited','Object 8 Visited','Object 9 Visited','Object 10 Visited','Object 11
Visited'...
,'Object 12 Visited','Location','BestOutside')
leg = 1;
end
if obs >= 13
legend('Spacecrafts Trajectory','Sun','Earth at Launch','Earth at Arrival','Object 1
Visited'...
,'Object 2 Visited','Object 3 Visited','Object 4 Visited','Object 5 Visited','Object 6
Visited'...
,'Object 7 Visited','Object 8 Visited','Object 9 Visited','Object 10 Visited','Object 11
Visited'...
,'Object 12 Visited','Object 13 Visited','Location','BestOutside')
leg = 1;
end
if obs >= 14
legend('Spacecrafts Trajectory','Sun','Earth at Launch','Earth at Arrival','Object 1
Visited'...
,'Object 2 Visited','Object 3 Visited','Object 4 Visited','Object 5 Visited','Object 6
Visited'...

```

```

, 'Object 7 Visited', 'Object 8 Visited', 'Object 9 Visited', 'Object 10 Visited', 'Object 11
Visited'...
, 'Object 12 Visited', 'Object 13 Visited', 'Object 14 Visited', 'Location', 'BestOutside')
leg = 1;
end
if obs >= 15
legend('Spacecrafts Trajectory', 'Sun', 'Earth at Launch', 'Earth at Arrival', 'Object 1
Visited'...
, 'Object 2 Visited', 'Object 3 Visited', 'Object 4 Visited', 'Object 5 Visited', 'Object 6
Visited'...
, 'Object 7 Visited', 'Object 8 Visited', 'Object 9 Visited', 'Object 10 Visited', 'Object 11
Visited'...
, 'Object 12 Visited', 'Object 13 Visited', 'Object 14 Visited', 'Object 15
Visited', 'Location', 'BestOutside')
leg = 1;
end
if obs >= 16
legend('Spacecrafts Trajectory', 'Sun', 'Earth at Launch', 'Earth at Arrival', 'Object 1
Visited'...
, 'Object 2 Visited', 'Object 3 Visited', 'Object 4 Visited', 'Object 5 Visited', 'Object 6
Visited'...
, 'Object 7 Visited', 'Object 8 Visited', 'Object 9 Visited', 'Object 10 Visited', 'Object 11
Visited'...
, 'Object 12 Visited', 'Object 13 Visited', 'Object 14 Visited', 'Object 15 Visited', 'Object
16 Visited'...
, 'Location', 'BestOutside')
leg = 1;
end
end
hold off
end

```

Appendix D: Asteroid Finder Matlab Code

```
function [Obj_names, Rxyzx, Rxyzy, Rxyzz, Vxyzx, Vxyzy, Vxyzz] =
findasteroid1(year_arrive, month_arrive, day_arrive)
%findasteroid finds the position and velocity in each asteroid's perifocal
%frame and then rotates these positions into the Sun-centered Heliocentric
%Ecliptic plane and outputs vectors for x,y,z positions for the total
%asteroid catalog and vectors containing Vx,Vy,Vz for each asteroid in the
%catalog

% Epoch (TDB)   Osculating epoch of the elements given as the modified Julian date
(Julian date - 2400000.5) TDB
% a (AU)   Semi-major axis of the orbit in AU
% e   Eccentricity of the orbit
% i (deg)   Inclination of the orbit with respect to the ecliptic plane and the equinox
of J2000 (J2000-Ecliptic) in degrees
% w (deg)   Argument of perihelion (J2000-Ecliptic) in degrees
% Node (deg)   Longitude of the ascending node (J2000-Ecliptic) in degrees
% M (deg)   Mean anomaly at epoch in degrees
% q (AU)   Perihelion distance of the orbit in AU
% Q (AU)   Aphelion distance of the orbit in AU
% P (yr)   Orbital period in Julian years
% H (mag)   Absolute V-magnitude
% MOID (AU)   Minimum orbit intersection distance (the minimum distance between the
osculating orbits of the NEO and the Earth)
% ref   Orbital solution reference
% class   Object classification: NEA="Near-Earth Asteroid", AMO="Amor",
% APO="Apollo", ATE="Aten", or IEO="Interior Earth Object". A trailing "*" indicates the
object is also a potentially hazardous asteroid. (see definitions)

% Constants from www.celestrak.com code
au           = 149597870.691;           % km
sunradius    = 696000.0;               % km
masssun      = 1.9891e30;              % kg
% Constants from http://www.planck.com/heliocentric.htm
musunm       = 1.32712440018e20;       % m3/s2
musunkm      = musunm/(1000^3);        % km3/s2
musunau      = 1; % DU3/TU2 % musunkm*((86400^2)/(au^3)); % au3/day2
TU2day       = 58.132821;              % Days

[numerical txt] = xlsread('Full Asteroid List (11Nov09).xlsx',1,'a2:p6509');
%txt = xlsread('Full Asteroid List (11Nov09).xlsx',1,'q2:r6509');
Obj_names = txt(1:6508);               % Vector of Object Names
% disp('Object Class Type')
Class = txt(6509:13016);               % Vector of Object Classes
% disp('Epochs in TDB')
Epochs = numeric(1:6508);             % Vector of Epochs in TDB
% disp('Semi-major Axes in AU's')
Semi = numeric(6509:13016);            % Vector of Semi-major Axes in AU's
% disp('Eccentricities')
Eccent = numeric(13017:19524);         % Vector of Eccentricities
% disp('Inclinations in Degrees')
Inc = numeric(19525:26032);            % Vector of Inclinations in Degrees
% disp('Arguments of Perihelions in Degrees')
Arg_per = numeric(26033:32540);        % Vector of Argument of Perihelions in Degrees
% disp('Longitudes of Ascending Nodes in Degrees')
Long_Asc = numeric(32541:39048);       % Vector of Longitude of Ascending Nodes in Degrees
% disp('Mean Anamolies at Epoch in Degrees')
Mean_Ana = numeric(39049:45556);       % Vector of Mean Anamolies at Epoch in Degrees
% disp('Perihelion distance of the orbit in AU')
q = numeric(45557:52064);              % Vector of Object H magnitudes

jdarrive = jday(year_arrive, month_arrive, day_arrive, 12, 0, 0);

i = 1;
```

```

while i <= length(Eccent) % Executes
while i is less than or equal to length of the vector of eccentricities
    %Ang_Mom(i) = sqrt(musunau*Semi(i)*(1-Eccent(i)*Eccent(i))); %
    Calculates Magnitude of Angular Momentum for each asteroid in AU^2/TU (Wiesel pg. 56)
    %Semi_Min(i) = Semi(i)*sqrt(1-Eccent(i)*Eccent(i)); %
    Calculates Semi Minor Axis, b, for each asteroid in AU's (Wiesel pg. 55)
    mean_mot(i) = sqrt(musunau/(Semi(i)*Semi(i)*Semi(i))); % Calculates
    Mean Motion, n, for each asteroid in rad/TU (Wiesel pg. 59)
    TE(i) = jdarrrive-2400000.5-Epochs(i);
    M_rat(i) = Mean_Ana(i)/360;
    T(i) = 2*pi*sqrt((Semi(i).*Semi(i).*Semi(i))/musunau)*TU2day; %
Orbital periods
    T_num(i)= TE(i)./T(i) + M_rat(i);
    i = i+1;
end

i = 1;
while i <= length(T_num)
    while T_num(i) > 1
        T_num(i) = T_num(i) - 1;
    end
    i = i+1;
end

dT0 = T_num.*T/TU2day;
MA = mean_mot.*dT0;

i = 1;
while i <= length(T_num)
    [e(i),nu(i)] = newtonm ( Eccent(i),MA(i) );
    rscalar(i) = (Semi(i)*(1-Eccent(i)*Eccent(i)))/(1+Eccent(i)*cos(nu(i))); % Scalar r
    in AU's (Wiesel pg. 65)
    rvectorx(i) = rscalar(i)*cos(nu(i)); % r-Vector
    x-component in AU's (Wiesel pg. 65)
    rvectory(i) = rscalar(i)*sin(nu(i)); % r-Vector
    y-component in AU's (Wiesel pg. 65)
    p(i) = Semi(i)*(1-Eccent(i)*Eccent(i)); % Semi-latus
    Rectum (Sidi pg. 16)
    Vvectorx(i) = sqrt(musunau/p(i))*(-sin(nu(i))); % Velocity
    vector x-component in AU's/TU (Wiesel pg. 66)
    Vvectory(i) = sqrt(musunau/p(i))*(Eccent(i)+cos(nu(i))); % Velocity
    vector y-component in AU's/TU (Wiesel pg. 66)
    RotMatx = [cosd(Long_Asc(i))*cosd(Arg_per(i))-
sind(Long_Asc(i))*sind(Arg_per(i))*cosd(Inc(i)) -cosd(Long_Asc(i))*sind(Arg_per(i))-
sind(Long_Asc(i))*cosd(Arg_per(i))*cosd(Inc(i)) sind(Long_Asc(i))*sind(Inc(i))];
    RotMaty =
[sind(Long_Asc(i))*cosd(Arg_per(i))+cosd(Long_Asc(i))*sind(Arg_per(i))*cosd(Inc(i)) -
sind(Long_Asc(i))*sind(Arg_per(i))+cosd(Long_Asc(i))*cosd(Arg_per(i))*cosd(Inc(i)) -
cosd(Long_Asc(i))*sind(Inc(i))];
    RotMatz = [sind(Arg_per(i))*sind(Inc(i))
cosd(Arg_per(i))*sind(Inc(i))
cosd(Inc(i))];
    Rxyzx(i) = RotMatx*[rvectorx(i);rvectory(i);0];
    Rxyzy(i) = RotMaty*[rvectorx(i);rvectory(i);0];
    Rxyzz(i) = RotMatz*[rvectorx(i);rvectory(i);0];
    Vxyzx(i) = RotMatx*[Vvectorx(i); Vvectory(i); 0];
    Vxyzy(i) = RotMaty*[Vvectorx(i); Vvectory(i); 0];
    Vxyzz(i) = RotMatz*[Vvectorx(i); Vvectory(i); 0];
    i = i+1;
end
end

```

Appendix E: Comet Finder Matlab Code

```

function [Obj_names, Rxyzx, Rxyzy, Rxyzz, Vxyzx, Vxyzy, Vxyzz] = findcomet1(year_arrive,
month_arrive, day_arrive)

```

```

%findasteroid finds the position and velocity in each asteroid's perifocal
%frame and then rotates these positions into the Sun-centered Heliocentric
%Ecliptic plane and outputs vectors for x,y,z positions for the total
%asteroid catalog and vectors containing Vx,Vy,Vz for each asteroid in the
%catalog

% Epoch (TDB)   Osculating epoch of the elements given as the modified Julian date
(Julian date - 2400000.5) TDB
% a (AU)   Semi-major axis of the orbit in AU
% e   Eccentricity of the orbit
% i (deg)   Inclination of the orbit with respect to the ecliptic plane and the equinox
of J2000 (J2000-Ecliptic) in degrees
% w (deg)   Argument of perihelion (J2000-Ecliptic) in degrees
% Node (deg)   Longitude of the ascending node (J2000-Ecliptic) in degrees
% M (deg)   Mean anomaly at epoch in degrees
% q (AU)   Perihelion distance of the orbit in AU
% Q (AU)   Aphelion distance of the orbit in AU
% P (yr)   Orbital period in Julian years
% H (mag)   Absolute V-magnitude
% MOID (AU)   Minimum orbit intersection distance (the minimum distance between the
osculating orbits of the NEO and the Earth)
% ref   Orbital solution reference
% class   Object classification: NEA="Near-Earth Asteroid", AMO="Amor",
APO="Apollo", ATE="Aten", or IEO="Interior Earth Object". A trailing "*" indicates the
object is also a potentially hazardous asteroid. (see definitions)

% Constants from www.celestrak.com code
au           = 149597870.691;           % km
sunradius    = 696000.0;               % km
masssun      = 1.9891e30;              % kg
% Constants from http://www.planck.com/heliocentric.htm
musunm       = 1.32712440018e20;       % m3/s2
musunkm      = musunm/(1000^3);        % km3/s2
musunau      = 1; % DU3/TU2 % musunkm*((86400^2)/(au^3)); % au3/day2
TU2day       = 58.132821;              % Days`

[numerical txt] = xlsread('Full Comet List (16Nov09).xlsx',1,'a2:k152');

%disp('Object Names')
Obj_names = txt(1:151);                % Vector of Object Names
%disp('Epochs in TDB')
Epochs = numeric(1:151);              % Vector of Epochs in TDB
%disp('Time of perihelion passage in TDB')
TP = numeric(152:302);
%disp('Eccentricities')
Eccent = numeric(303:453);            % Vector of Eccentricities
%disp('Inclinations in Degrees')
Inc = numeric(454:604);                % Vector of Inclinations in Degrees
%disp('Arguments of Perihelions in Degrees')
Arg_per = numeric(605:755);            % Vector of Argument of Perihelions in Degrees
%disp('Longitudes of Ascending Nodes in Degrees')
Long_Asc = numeric(756:906);           % Vector of Longitude of Ascending Nodes in Degrees
%disp('Perihelion distance of the orbit in AU')
rp = numeric(907:1057);                % Vector of Object H magnitudes
%disp('Aphelion distance of the orbit in AU')
ra = numeric(1058:1208);                % Vector of Object H magnitudes

jdarrive = jday(year_arrive, month_arrive, day_arrive, 12, 0, 0);

i = 1;
while i <= length(Eccent) % Executes
while i is less than or equal to length of B-1
    Semi(i) = rp(i)/(1-Eccent(i));
    %Semi1(i) = (rp(i)+ra(i))/2;
    %Semi_diff(i) = Semi(i)-Semi(i);
    %Ang_Mom(i) = sqrt(musunau*Semi(i)*(1-Eccent(i)*Eccent(i))); %
    Calculates Magnitude of Angular Momentum for each asteroid in AU^2/TU (Wiesel pg. 56)
    %Semi_Min(i) = Semi(i)*sqrt(1-Eccent(i)*Eccent(i)); %
    Calculates Semi Minor Axis, b, for each asteroid in AU's (Wiesel pg. 55)
endwhile
endwhile

```

```

        mean_mot(i) = sqrt(musunau/(Semi(i)*Semi(i)*Semi(i))); % Calculates
Mean Motion, n, for each asteroid in rad/TU (Wiesel pg. 55)
TE(i) = jdarrive-2400000.5-Epochs(i);
T0(i) = jdarrive - TP(i);
%M_rat(i) = Mean_Ana(i)/360;
T(i) = 2*pi*sqrt((Semi(i).*Semi(i).*Semi(i))/musunau)*TU2day; %
Orbital periods
T_num(i)= T0(i)./T(i);
i = i+1;
end

i = 1;
while i <= length(T_num)
    while T_num(i) > 1
        T_num(i) = T_num(i) - 1;
    end
    i = i+1;
end

dT0 = T_num.*T/TU2day;
MA = mean_mot.*dT0;

i = 1;
while i <= length(T_num)
    [e(i),nu(i)] = newtonm ( Eccent(i),MA(i) );
    rscalar(i) = (Semi(i)*(1-Eccent(i)*Eccent(i)))/(1+Eccent(i)*cos(nu(i))); % Scalar r
in AU's (Wiesel pg. 65)
    rvectorx(i) = rscalar(i)*cos(nu(i)); % r-Vector
x-component in AU's (Wiesel pg. 65)
    rvectory(i) = rscalar(i)*sin(nu(i)); % r-Vector
y-component in AU's (Wiesel pg. 65)
    p(i) = Semi(i)*(1-Eccent(i)*Eccent(i)); % Semi-latus
Rectum (Sidi pg. 16)
    Vvectorx(i) = sqrt(musunau/p(i))*(-sin(nu(i))); % Velocity
vector x-component in AU's/TU (Wiesel pg. 66)
    Vvectory(i) = sqrt(musunau/p(i))*(Eccent(i)+cos(nu(i))); % Velocity
vector y-component in AU's/TU (Wiesel pg. 66)
    RotMatx = [cosd(Long_Asc(i))*cosd(Arg_per(i))-
sind(Long_Asc(i))*sind(Arg_per(i))*cosd(Inc(i)) -cosd(Long_Asc(i))*sind(Arg_per(i))-
sind(Long_Asc(i))*cosd(Arg_per(i))*cosd(Inc(i)) sind(Long_Asc(i))*sind(Inc(i))];
    RotMaty =
[sind(Long_Asc(i))*cosd(Arg_per(i))+cosd(Long_Asc(i))*sind(Arg_per(i))*cosd(Inc(i)) -
sind(Long_Asc(i))*sind(Arg_per(i))+cosd(Long_Asc(i))*cosd(Arg_per(i))*cosd(Inc(i)) -
cosd(Long_Asc(i))*sind(Inc(i))];
    RotMatz = [sind(Arg_per(i))*sind(Inc(i))
cosd(Arg_per(i))*sind(Inc(i))
cosd(Inc(i))];
    Rxyzx(i) = RotMatx*[rvectorx(i);rvectory(i);0];
    Rxyzy(i) = RotMaty*[rvectorx(i);rvectory(i);0];
    Rxyzz(i) = RotMatz*[rvectorx(i);rvectory(i);0];
    Vxyzx(i) = RotMatx*[Vvectorx(i); Vvectory(i); 0];
    Vxyzy(i) = RotMaty*[Vvectorx(i); Vvectory(i); 0];
    Vxyzz(i) = RotMatz*[Vvectorx(i); Vvectory(i); 0];
    i = i+1;
end
end

```


Appendix F: Planet Finder Matlab Code

Mercury

```
function
[eccen,peridist,incl,lan,periarg,meanmo,meananom,semimaj,apodist,period,trueanom] =
findmercury(year,month,day)
%findmercury finds the location of Mercury in the Sun-centered Heliocentric
%Ecliptic plane between 01 Jan 10 to 31 Dec 25

% Coordinate system description:
%
%   Ecliptic and Mean Equinox of Reference Epoch
%
%   Reference epoch: J2000.0
%   xy-plane: plane of the Earth's orbit at the reference epoch
%   x-axis   : out along ascending node of instantaneous plane of the Earth's
%               orbit and the Earth's mean equator at the reference epoch
%   z-axis   : perpendicular to the xy-plane in the directional (+ or -) sense
%               of Earth's north pole at the reference epoch.
%
% Symbol meaning [1 AU=149597870.691 km, 1 day=86400.0 s]:
%
%   JDCT      Epoch Julian Date, Coordinate Time
%   EC         Eccentricity, e
%   QR         Periapsis distance, q (AU)
%   IN         Inclination w.r.t xy-plane, i (degrees)
%   OM         Longitude of Ascending Node, OMEGA, (degrees)
%   W          Argument of Perifocus, w (degrees)
%   Tp         Time of periapsis relative to epoch (P-E) (day)
%   N          Mean motion, n (degrees/day)
%   MA         Mean anomaly, M (degrees)
%   TA         True anomaly, nu (degrees)
%   A          Semi-major axis, a (AU)
%   AD         Apoapsis distance (AU)
%   PR         Orbital period (day)

jd = jday(year, month, day, 0, 0, 0);

[numerical txt] = xlsread('Mercury(06Dec09).xlsx',2);
%disp('Dates')
date = txt(1:5844);           % Vector of Object Dates
%disp('Epochs')
epoch = numerical(1:5844);     % Vector of Object Epochs in TDB
%disp('Eccentricity')
EC = numerical(5845:11688);    % Vector of Eccentricities
%disp('Periapsis Distance in AUs')
QR = numerical(11689:17532);   % Vector of Periapsis Distance in AU's
%disp('Inclination in Degrees')
IN = numerical(17533:23376);    % Vector of Inclinations in Degrees
%disp('Longitude of the Ascending Node in Degrees')
OM = numerical(23377:29220);    % Vector of Longitudes of Ascending Node in Degrees
%disp('Argument of Perigee in Degrees')
W = numerical(29221:35064);     % Vector of Arguments of Perigee in Degrees
%disp('Time of Periapsis relative to Epoch (P-E) in Days')
Tp = numerical(35065:40908);    % Vector of Times of Periapsis relative to Epoch in
Days
%disp('Mean Motion in Degrees/Day')
N = numerical(40909:46752);     % Vector of Mean Motions in Degrees/Day
%disp('Mean Anomaly in Degrees')
MA = numerical(46753:52596);    % Vector of Mean Anomalies in Degrees
%disp('True Anomaly in Degrees')
TA = numerical(52597:58440);    % Vector of True Anomalies in Degrees
%disp('Semi-Major Axis in AUs')
A = numerical(58441:64284);     % Vector of Semi-Major Axes in AU's
%disp('Apoapsis Distance in AUs')
```

```

AD = numeric(64285:70128);           % Vector of Apoapsis Distances in AU's
%disp('Orbital Period in Days')
PR = numeric(70129:75972);           % Vector of Orbital Periods in Days

i = 1;
diff = 1;
while diff > 0
    diff = jd - epoch(i);
    i = i+1;
end
q = i-1;

eccen = EC(q);
peridist = QR(q);
incl = IN(q);
lan = OM(q);
periarg = W(q);
meanmo = N(q);
meananom = MA(q);
trueanom = TA(q);
semimaj = A(q);
apodist = AD(q);
period = PR(q);
JDCT = epoch(q);
peritime = Tp(q);
end

```

Venus

```

function
[eccen,peridist,incl,lan,periarg,meanmo,meananom,semimaj,apodist,period,trueanom] =
findvenus(year,month,day)
%findvenus finds the location of Venus in the Sun-centered Heliocentric
%Ecliptic plane between 01 Jan 10 to 31 Dec 25

% Coordinate system description:
%
%   Ecliptic and Mean Equinox of Reference Epoch
%
%   Reference epoch: J2000.0
%   xy-plane: plane of the Earth's orbit at the reference epoch
%   x-axis   : out along ascending node of instantaneous plane of the Earth's
%               orbit and the Earth's mean equator at the reference epoch
%   z-axis   : perpendicular to the xy-plane in the directional (+ or -) sense
%               of Earth's north pole at the reference epoch.
%
% Symbol meaning [1 AU=149597870.691 km, 1 day=86400.0 s]:
%
%   JDCT      Epoch Julian Date, Coordinate Time
%   EC        Eccentricity, e
%   QR        Periapsis distance, q (AU)
%   IN        Inclination w.r.t xy-plane, i (degrees)
%   OM        Longitude of Ascending Node, OMEGA, (degrees)
%   W         Argument of Perifocus, w (degrees)
%   Tp        Time of periapsis relative to epoch (P-E) (day)
%   N         Mean motion, n (degrees/day)
%   MA        Mean anomaly, M (degrees)
%   TA        True anomaly, nu (degrees)
%   A         Semi-major axis, a (AU)
%   AD        Apoapsis distance (AU)
%   PR        Orbital period (day)

jd = jday(year, month, day, 0, 0, 0);

[numerical txt] = xlsread('Venus(06Dec09).xlsx',2);
%disp('Dates')
date = txt(1:5844);           % Vector of Object Dates
%disp('Epochs')

```

```

epoch = numeric(1:5844);           % Vector of Object Epochs in TDB
%disp('Eccentricity')
EC = numeric(5845:11688);          % Vector of Eccentricities
%disp('Periapsis Distance in AUs')
QR = numeric(11689:17532);          % Vector of Periapsis Distance in AU's
%disp('Inclination in Degrees')
IN = numeric(17533:23376);          % Vector of Inclinations in Degrees
%disp('Longitude of the Ascending Node in Degrees')
OM = numeric(23377:29220);          % Vector of Longitudes of Ascending Node in Degrees
%disp('Argument of Perigee in Degrees')
W = numeric(29221:35064);           % Vector of Arguments of Perigee in Degrees
%disp('Time of Periapsis relative to Epoch (P-E) in Days')
Tp = numeric(35065:40908);          % Vector of Times of Periapsis relative to Epoch in Days
%disp('Mean Motion in Degrees/Day')
N = numeric(40909:46752);           % Vector of Mean Motions in Degrees/Day
%disp('Mean Anamoly in Degrees')
MA = numeric(46753:52596);          % Vector of Mean Anamolies in Degrees
%disp('True Anamoly in Degrees')
TA = numeric(52597:58440);          % Vector of True Anamolies in Degrees
%disp('Semi-Major Axis in AUs')
A = numeric(58441:64284);           % Vector of Semi-Major Axes in AU's
%disp('Apoapsis Distance in AUs')
AD = numeric(64285:70128);          % Vector of Apoapsis Distances in AU's
%disp('Orbital Period in Days')
PR = numeric(70129:75972);          % Vector of Orbital Periods in Days

i = 1;
diff = 1;
while diff > 0
    diff = jd - epoch(i);
    i = i+1;
end
q = i-1;

eccen = EC(q);
peridist = QR(q);
incl = IN(q);
lan = OM(q);
periarg = W(q);
meanmo = N(q);
meananom = MA(q);
trueanom = TA(q);
semimaj = A(q);
apodist = AD(q);
period = PR(q);
JDCT = epoch(q);
peritime = Tp(q);
end

```

Earth

```

function
[eccen,peridist,incl,lan,periarg,meanmo,meananom,semimaj,apodist,period,trueanom] =
findearth1(year,month,day)
%findearth finds the location of Earth in the Sun-centered Heliocentric
%Ecliptic plane between 01 Jan 10 to 31 Dec 25

% Coordinate system description:
%
%   Ecliptic and Mean Equinox of Reference Epoch
%
%   Reference epoch: J2000.0
%   xy-plane: plane of the Earth's orbit at the reference epoch
%   x-axis  : out along ascending node of instantaneous plane of the Earth's
%             orbit and the Earth's mean equator at the reference epoch
%   z-axis  : perpendicular to the xy-plane in the directional (+ or -) sense

```

```

%           of Earth's north pole at the reference epoch.
%
% Symbol meaning [1 AU=149597870.691 km, 1 day=86400.0 s]:
%
%      JDCT      Epoch Julian Date, Coordinate Time
%      EC        Eccentricity, e
%      QR        Periapsis distance, q (AU)
%      IN        Inclination w.r.t xy-plane, i (degrees)
%      OM        Longitude of Ascending Node, OMEGA, (degrees)
%      W         Argument of Perifocus, w (degrees)
%      Tp        Time of periapsis relative to epoch (P-E) (day)
%      N         Mean motion, n (degrees/day)
%      MA        Mean anomaly, M (degrees)
%      TA        True anomaly, nu (degrees)
%      A         Semi-major axis, a (AU)
%      AD        Apoapsis distance (AU)
%      PR        Orbital period (day)

jd = jday(year, month, day, 0, 0, 0);

[numerical txt] = xlsread('Earth(06Dec09).xlsx',2);
%disp('Dates')
date = txt(1:5844);           % Vector of Object Dates
%disp('Epochs')
epoch = numerical(1:5844);     % Vector of Object Epochs in TDB
%disp('Eccentricity')
EC = numerical(5845:11688);    % Vector of Eccentricities
%disp('Periapsis Distance in AUs')
QR = numerical(11689:17532);   % Vector of Periapsis Distance in AU's
%disp('Inclination in Degrees')
IN = numerical(17533:23376);   % Vector of Inclinations in Degrees
%disp('Longitude of the Ascending Node in Degrees')
OM = numerical(23377:29220);   % Vector of Longitudes of Ascending Node in Degrees
%disp('Argument of Perigee in Degrees')
W = numerical(29221:35064);    % Vector of Arguments of Perigee in Degrees
%disp('Time of Periapsis relative to Epoch (P-E) in Days')
Tp = numerical(35065:40908);   % Vector of Times of Periapsis relative to Epoch in
Days
%disp('Mean Motion in Degrees/Day')
N = numerical(40909:46752);    % Vector of Mean Motions in Degrees/Day
%disp('Mean Anomaly in Degrees')
MA = numerical(46753:52596);   % Vector of Mean Anomalies in Degrees
%disp('True Anomaly in Degrees')
TA = numerical(52597:58440);   % Vector of True Anomalies in Degrees
%disp('Semi-Major Axis in AUs')
A = numerical(58441:64284);    % Vector of Semi-Major Axes in AU's
%disp('Apoapsis Distance in AUs')
AD = numerical(64285:70128);   % Vector of Apoapsis Distances in AU's
%disp('Orbital Period in Days')
PR = numerical(70129:75972);   % Vector of Orbital Periods in Days

i = 1;
diff = 1;
while diff > 0
    diff = jd - epoch(i);
    i = i+1;
end
q = i-1;

eccen = EC(q);
peridist = QR(q);
incl = IN(q);
lan = OM(q);
periarg = W(q);
meanmo = N(q);
meananom = MA(q);
trueanom = TA(q);
semimaj = A(q);
apodist = AD(q);

```

```

period = PR(q);
JDCT = epoch(q);
peritime = Tp(q);
end

```

Moon

```

function
[eccen,peridist,incl,lan,periarg,meanmo,meananom,semimaj,apodist,period,trueanom] =
findmoon1(year,month,day)
%findmoon finds the location of the Moon in the Sun-centered Heliocentric
%Ecliptic plane between 01 Jan 10 to 31 Dec 25

% Coordinate system description:
%
%   Ecliptic and Mean Equinox of Reference Epoch
%
%   Reference epoch: J2000.0
%   xy-plane: plane of the Earth's orbit at the reference epoch
%   x-axis   : out along ascending node of instantaneous plane of the Earth's
%               orbit and the Earth's mean equator at the reference epoch
%   z-axis   : perpendicular to the xy-plane in the directional (+ or -) sense
%               of Earth's north pole at the reference epoch.
%
% Symbol meaning [1 AU=149597870.691 km, 1 day=86400.0 s]:
%
%   JDCT      Epoch Julian Date, Coordinate Time
%   EC         Eccentricity, e
%   QR         Periapsis distance, q (AU)
%   IN         Inclination w.r.t xy-plane, i (degrees)
%   OM         Longitude of Ascending Node, OMEGA, (degrees)
%   W          Argument of Perifocus, w (degrees)
%   Tp         Time of periapsis relative to epoch (P-E) (day)
%   N          Mean motion, n (degrees/day)
%   MA         Mean anomaly, M (degrees)
%   TA         True anomaly, nu (degrees)
%   A          Semi-major axis, a (AU)
%   AD         Apoapsis distance (AU)
%   PR         Orbital period (day)

jd = jday(year, month, day, 0, 0, 0);

[numeric txt] = xlsread('Moon(06Dec09).xlsx',2);
%disp('Dates')
date = txt(1:5844);           % Vector of Object Dates
%disp('Epochs')
epoch = numeric(1:5844);      % Vector of Object Epochs in TDB
%disp('Eccentricity')
EC = numeric(5845:11688);     % Vector of Eccentricities
%disp('Periapsis Distance in AUs')
QR = numeric(11689:17532);    % Vector of Periapsis Distance in AU's
%disp('Inclination in Degrees')
IN = numeric(17533:23376);    % Vector of Inclinations in Degrees
%disp('Longitude of the Ascending Node in Degrees')
OM = numeric(23377:29220);    % Vector of Longitudes of Ascending Node in Degrees
%disp('Argument of Perigee in Degrees')
W = numeric(29221:35064);     % Vector of Arguments of Perigee in Degrees
%disp('Time of Periapsis relative to Epoch (P-E) in Days')
Tp = numeric(35065:40908);    % Vector of Times of Periapsis relative to Epoch in
Days
%disp('Mean Motion in Degrees/Day')
N = numeric(40909:46752);     % Vector of Mean Motions in Degrees/Day
%disp('Mean Anomaly in Degrees')
MA = numeric(46753:52596);    % Vector of Mean Anomalies in Degrees
%disp('True Anomaly in Degrees')
TA = numeric(52597:58440);    % Vector of True Anomalies in Degrees
%disp('Semi-Major Axis in AUs')
A = numeric(58441:64284);     % Vector of Semi-Major Axes in AU's

```

```

%disp('Apoapsis Distance in AUs')
AD = numeric(64285:70128); % Vector of Apoapsis Distances in AU's
%disp('Orbital Period in Days')
PR = numeric(70129:75972); % Vector of Orbital Periods in Days

i = 1;
diff = 1;
while diff > 0
    diff = jd - epoch(i);
    i = i+1;
end
q = i-1;

eccen = EC(q);
peridist = QR(q);
incl = IN(q);
lan = OM(q);
periarg = W(q);
meanmo = N(q);
meananom = MA(q);
trueanom = TA(q);
semimaj = A(q);
apodist = AD(q);
period = PR(q);
JDCT = epoch(q);
peritime = Tp(q);
end

```

Mars

```

function
[eccen,peridist,incl,lan,periarg,meanmo,meananom,semimaj,apodist,period,trueanom] =
findmars1(year,month,day)
%findmars finds the location of Mars in the Sun-centered Heliocentric
%Ecliptic plane between 01 Jan 10 to 31 Dec 25

% Coordinate system description:
%
%   Ecliptic and Mean Equinox of Reference Epoch
%
%   Reference epoch: J2000.0
%   xy-plane: plane of the Earth's orbit at the reference epoch
%   x-axis : out along ascending node of instantaneous plane of the Earth's
%   orbit and the Earth's mean equator at the reference epoch
%   z-axis : perpendicular to the xy-plane in the directional (+ or -) sense
%           of Earth's north pole at the reference epoch.
%
% Symbol meaning [1 AU=149597870.691 km, 1 day=86400.0 s]:
%
%   JDCT      Epoch Julian Date, Coordinate Time
%   EC        Eccentricity, e
%   QR        Periapsis distance, q (AU)
%   IN        Inclination w.r.t xy-plane, i (degrees)
%   OM        Longitude of Ascending Node, OMEGA, (degrees)
%   W         Argument of Perifocus, w (degrees)
%   Tp        Time of periapsis relative to epoch (P-E) (day)
%   N         Mean motion, n (degrees/day)
%   MA        Mean anomaly, M (degrees)
%   TA        True anomaly, nu (degrees)
%   A         Semi-major axis, a (AU)
%   AD        Apoapsis distance (AU)
%   PR        Orbital period (day)

jd = jday(year, month, day, 0, 0, 0);

[numerical txt] = xlsread('Mars(06Dec09).xlsx',2);
%disp('Dates')
date = txt(1:5844); % Vector of Object Dates

```

```

%disp('Epochs')
epoch = numeric(1:5844); % Vector of Object Epochs in TDB
%disp('Eccentricity')
EC = numeric(5845:11688); % Vector of Eccentricities
%disp('Periapsis Distance in AUs')
QR = numeric(11689:17532); % Vector of Periapsis Distance in AU's
%disp('Inclination in Degrees')
IN = numeric(17533:23376); % Vector of Inclinations in Degrees
%disp('Longitude of the Ascending Node in Degrees')
OM = numeric(23377:29220); % Vector of Longitudes of Ascending Node in Degrees
%disp('Argument of Perigee in Degrees')
W = numeric(29221:35064); % Vector of Arguments of Perigee in Degrees
%disp('Time of Periapsis relative to Epoch (P-E) in Days')
Tp = numeric(35065:40908); % Vector of Times of Periapsis relative to Epoch in Days
%disp('Mean Motion in Degrees/Day')
N = numeric(40909:46752); % Vector of Mean Motions in Degrees/Day
%disp('Mean Anomaly in Degrees')
MA = numeric(46753:52596); % Vector of Mean Anomalies in Degrees
%disp('True Anomaly in Degrees')
TA = numeric(52597:58440); % Vector of True Anomalies in Degrees
%disp('Semi-Major Axis in AUs')
A = numeric(58441:64284); % Vector of Semi-Major Axes in AU's
%disp('Apoapsis Distance in AUs')
AD = numeric(64285:70128); % Vector of Apoapsis Distances in AU's
%disp('Orbital Period in Days')
PR = numeric(70129:75972); % Vector of Orbital Periods in Days

i = 1;
diff = 1;
while diff > 0
    diff = jd - epoch(i);
    i = i+1;
end
q = i-1;

eccen = EC(q);
peridist = QR(q);
incl = IN(q);
lan = OM(q);
periarg = W(q);
meanmo = N(q);
meananom = MA(q);
trueanom = TA(q);
semimaj = A(q);
apodist = AD(q);
period = PR(q);
JDCT = epoch(q);
peritime = Tp(q);
end

```

Jupiter

```

function
[eccen,peridist,incl,lan,periarg,meanmo,meananom,semimaj,apodist,period,trueanom] =
findjupiter(year,month,day)
%findjupiter finds the location of Jupiter in the Sun-centered Heliocentric
%Ecliptic plane between 01 Jan 10 to 31 Dec 25

% Coordinate system description:
%
%   Ecliptic and Mean Equinox of Reference Epoch
%
%   Reference epoch: J2000.0
%   xy-plane: plane of the Earth's orbit at the reference epoch
%   x-axis : out along ascending node of instantaneous plane of the Earth's
%           orbit and the Earth's mean equator at the reference epoch
%   z-axis : perpendicular to the xy-plane in the directional (+ or -) sense

```

```

%           of Earth's north pole at the reference epoch.
%
% Symbol meaning [1 AU=149597870.691 km, 1 day=86400.0 s]:
%
%   JDCT      Epoch Julian Date, Coordinate Time
%   EC         Eccentricity, e
%   QR         Periapsis distance, q (AU)
%   IN         Inclination w.r.t xy-plane, i (degrees)
%   OM         Longitude of Ascending Node, OMEGA, (degrees)
%   W          Argument of Perifocus, w (degrees)
%   Tp        Time of periapsis relative to epoch (P-E) (day)
%   N          Mean motion, n (degrees/day)
%   MA         Mean anomaly, M (degrees)
%   TA         True anomaly, nu (degrees)
%   A          Semi-major axis, a (AU)
%   AD         Apoapsis distance (AU)
%   PR         Orbital period (day)

jd = jday(year, month, day, 0, 0, 0);

[numerical txt] = xlsread('Jupiter(06Dec09).xlsx',2);
%disp('Dates')
date = txt(1:5844);           % Vector of Object Dates
%disp('Epochs')
epoch = numerical(1:5844);     % Vector of Object Epochs in TDB
%disp('Eccentricity')
EC = numerical(5845:11688);    % Vector of Eccentricities
%disp('Periapsis Distance in AUs')
QR = numerical(11689:17532);   % Vector of Periapsis Distance in AU's
%disp('Inclination in Degrees')
IN = numerical(17533:23376);   % Vector of Inclinations in Degrees
%disp('Longitude of the Ascending Node in Degrees')
OM = numerical(23377:29220);   % Vector of Longitudes of Ascending Node in Degrees
%disp('Argument of Perigee in Degrees')
W = numerical(29221:35064);    % Vector of Arguments of Perigee in Degrees
%disp('Time of Periapsis relative to Epoch (P-E) in Days')
Tp = numerical(35065:40908);   % Vector of Times of Periapsis relative to Epoch in
Days
%disp('Mean Motion in Degrees/Day')
N = numerical(40909:46752);    % Vector of Mean Motions in Degrees/Day
%disp('Mean Anomaly in Degrees')
MA = numerical(46753:52596);   % Vector of Mean Anomalies in Degrees
%disp('True Anomaly in Degrees')
TA = numerical(52597:58440);   % Vector of True Anomalies in Degrees
%disp('Semi-Major Axis in AUs')
A = numerical(58441:64284);    % Vector of Semi-Major Axes in AU's
%disp('Apoapsis Distance in AUs')
AD = numerical(64285:70128);   % Vector of Apoapsis Distances in AU's
%disp('Orbital Period in Days')
PR = numerical(70129:75972);   % Vector of Orbital Periods in Days

i = 1;
diff = 1;
while diff > 0
    diff = jd - epoch(i);
    i = i+1;
end
q = i-1;

eccen = EC(q);
peridist = QR(q);
incl = IN(q);
lan = OM(q);
periarg = W(q);
meanmo = N(q);
meananom = MA(q);
trueanom = TA(q);
semimaj = A(q);
apodist = AD(q);

```



```

period = PR(q);
JDCT = epoch(q);
peritime = Tp(q);
end

```

Saturn

```

function
[eccen,peridist,incl,lan,periarg,meanmo,meananom,semimaj,apodist,period,trueanom] =
findsaturn(year,month,day)
%findsaturn finds the location of Saturn in the Sun-centered Heliocentric
%Ecliptic plane between 01 Jan 10 to 31 Dec 25

% Coordinate system description:
%
%   Ecliptic and Mean Equinox of Reference Epoch
%
%   Reference epoch: J2000.0
%   xy-plane: plane of the Earth's orbit at the reference epoch
%   x-axis   : out along ascending node of instantaneous plane of the Earth's
%               orbit and the Earth's mean equator at the reference epoch
%   z-axis   : perpendicular to the xy-plane in the directional (+ or -) sense
%               of Earth's north pole at the reference epoch.
%
% Symbol meaning [1 AU=149597870.691 km, 1 day=86400.0 s]:
%
%   JDCT      Epoch Julian Date, Coordinate Time
%   EC         Eccentricity, e
%   QR         Periapsis distance, q (AU)
%   IN         Inclination w.r.t xy-plane, i (degrees)
%   OM         Longitude of Ascending Node, OMEGA, (degrees)
%   W          Argument of Perifocus, w (degrees)
%   Tp         Time of periapsis relative to epoch (P-E) (day)
%   N          Mean motion, n (degrees/day)
%   MA         Mean anomaly, M (degrees)
%   TA         True anomaly, nu (degrees)
%   A          Semi-major axis, a (AU)
%   AD         Apoapsis distance (AU)
%   PR         Orbital period (day)

jd = jday(year, month, day, 0, 0, 0);

[numeric txt] = xlsread('Saturn(06Dec09).xlsx',2);
%disp('Dates')
date = txt(1:5844);           % Vector of Object Dates
%disp('Epochs')
epoch = numeric(1:5844);      % Vector of Object Epochs in TDB
%disp('Eccentricity')
EC = numeric(5845:11688);     % Vector of Eccentricities
%disp('Periapsis Distance in AUs')
QR = numeric(11689:17532);    % Vector of Periapsis Distance in AU's
%disp('Inclination in Degrees')
IN = numeric(17533:23376);    % Vector of Inclinations in Degrees
%disp('Longitude of the Ascending Node in Degrees')
OM = numeric(23377:29220);    % Vector of Longitudes of Ascending Node in Degrees
%disp('Argument of Perigee in Degrees')
W = numeric(29221:35064);     % Vector of Arguments of Perigee in Degrees
%disp('Time of Periapsis relative to Epoch (P-E) in Days')
Tp = numeric(35065:40908);    % Vector of Times of Periapsis relative to Epoch in
Days
%disp('Mean Motion in Degrees/Day')
N = numeric(40909:46752);     % Vector of Mean Motions in Degrees/Day
%disp('Mean Anomaly in Degrees')
MA = numeric(46753:52596);    % Vector of Mean Anomalies in Degrees
%disp('True Anomaly in Degrees')
TA = numeric(52597:58440);    % Vector of True Anomalies in Degrees
%disp('Semi-Major Axis in AUs')
A = numeric(58441:64284);     % Vector of Semi-Major Axes in AU's

```

```

%disp('Apoapsis Distance in AUs')
AD = numeric(64285:70128); % Vector of Apoapsis Distances in AU's
%disp('Orbital Period in Days')
PR = numeric(70129:75972); % Vector of Orbital Periods in Days

i = 1;
diff = 1;
while diff > 0
    diff = jd - epoch(i);
    i = i+1;
end
q = i-1;

eccen = EC(q);
peridist = QR(q);
incl = IN(q);
lan = OM(q);
periarg = W(q);
meanmo = N(q);
meananom = MA(q);
trueanom = TA(q);
semimaj = A(q);
apodist = AD(q);
period = PR(q);
JDCT = epoch(q);
peritime = Tp(q);
end

```

Uranus

```

function
[eccen,peridist,incl,lan,periarg,meanmo,meananom,semimaj,apodist,period,trueanom] =
finduranus(year,month,day)
%finduranus finds the location of Uranus in the Sun-centered Heliocentric
%Ecliptic plane between 01 Jan 10 to 31 Dec 25

% Coordinate system description:
%
%   Ecliptic and Mean Equinox of Reference Epoch
%
%   Reference epoch: J2000.0
%   xy-plane: plane of the Earth's orbit at the reference epoch
%   x-axis : out along ascending node of instantaneous plane of the Earth's
%   orbit and the Earth's mean equator at the reference epoch
%   z-axis : perpendicular to the xy-plane in the directional (+ or -) sense
%           of Earth's north pole at the reference epoch.
%
% Symbol meaning [1 AU=149597870.691 km, 1 day=86400.0 s]:
%
%   JDCT      Epoch Julian Date, Coordinate Time
%   EC        Eccentricity, e
%   QR        Periapsis distance, q (AU)
%   IN        Inclination w.r.t xy-plane, i (degrees)
%   OM        Longitude of Ascending Node, OMEGA, (degrees)
%   W         Argument of Perifocus, w (degrees)
%   Tp        Time of periapsis relative to epoch (P-E) (day)
%   N         Mean motion, n (degrees/day)
%   MA        Mean anomaly, M (degrees)
%   TA        True anomaly, nu (degrees)
%   A         Semi-major axis, a (AU)
%   AD        Apoapsis distance (AU)
%   PR        Orbital period (day)

jd = jday(year, month, day, 0, 0, 0);

[numerical txt] = xlsread('Uranus(06Dec09).xlsx',2);
%disp('Dates')
date = txt(1:5844); % Vector of Object Dates

```

```

%disp('Epochs')
epoch = numeric(1:5844); % Vector of Object Epochs in TDB
%disp('Eccentricity')
EC = numeric(5845:11688); % Vector of Eccentricities
%disp('Periapsis Distance in AUs')
QR = numeric(11689:17532); % Vector of Periapsis Distance in AU's
%disp('Inclination in Degrees')
IN = numeric(17533:23376); % Vector of Inclinations in Degrees
%disp('Longitude of the Ascending Node in Degrees')
OM = numeric(23377:29220); % Vector of Longitudes of Ascending Node in Degrees
%disp('Argument of Perigee in Degrees')
W = numeric(29221:35064); % Vector of Arguments of Perigee in Degrees
%disp('Time of Periapsis relative to Epoch (P-E) in Days')
Tp = numeric(35065:40908); % Vector of Times of Periapsis relative to Epoch in Days
%disp('Mean Motion in Degrees/Day')
N = numeric(40909:46752); % Vector of Mean Motions in Degrees/Day
%disp('Mean Anomaly in Degrees')
MA = numeric(46753:52596); % Vector of Mean Anomalies in Degrees
%disp('True Anomaly in Degrees')
TA = numeric(52597:58440); % Vector of True Anomalies in Degrees
%disp('Semi-Major Axis in AUs')
A = numeric(58441:64284); % Vector of Semi-Major Axes in AU's
%disp('Apoapsis Distance in AUs')
AD = numeric(64285:70128); % Vector of Apoapsis Distances in AU's
%disp('Orbital Period in Days')
PR = numeric(70129:75972); % Vector of Orbital Periods in Days

i = 1;
diff = 1;
while diff > 0
    diff = jd - epoch(i);
    i = i+1;
end
q = i-1;

eccen = EC(q);
peridist = QR(q);
incl = IN(q);
lan = OM(q);
periarg = W(q);
meanmo = N(q);
meananom = MA(q);
trueanom = TA(q);
semimaj = A(q);
apodist = AD(q);
period = PR(q);
JDCT = epoch(q);
peritime = Tp(q);
end

```

Neptune

```

function
[eccen,peridist,incl,lan,periarg,meanmo,meananom,semimaj,apodist,period,trueanom] =
findneptune(year,month,day)
%findneptune finds the location of Neptune in the Sun-centered Heliocentric
%Ecliptic plane between 01 Jan 10 to 31 Dec 25

% Coordinate system description:
%
%   Ecliptic and Mean Equinox of Reference Epoch
%
%   Reference epoch: J2000.0
%   xy-plane: plane of the Earth's orbit at the reference epoch
%   x-axis : out along ascending node of instantaneous plane of the Earth's
%           orbit and the Earth's mean equator at the reference epoch
%   z-axis : perpendicular to the xy-plane in the directional (+ or -) sense

```

```

%           of Earth's north pole at the reference epoch.
%
% Symbol meaning [1 AU=149597870.691 km, 1 day=86400.0 s]:
%
%      JDCT      Epoch Julian Date, Coordinate Time
%      EC        Eccentricity, e
%      QR        Periapsis distance, q (AU)
%      IN        Inclination w.r.t xy-plane, i (degrees)
%      OM        Longitude of Ascending Node, OMEGA, (degrees)
%      W         Argument of Perifocus, w (degrees)
%      Tp        Time of periapsis relative to epoch (P-E) (day)
%      N         Mean motion, n (degrees/day)
%      MA        Mean anomaly, M (degrees)
%      TA        True anomaly, nu (degrees)
%      A         Semi-major axis, a (AU)
%      AD        Apoapsis distance (AU)
%      PR        Orbital period (day)

jd = jday(year, month, day, 0, 0, 0);

[numeric txt] = xlsread('Neptune(06Dec09).xlsx',2);
%disp('Dates')
date = txt(1:5844);           % Vector of Object Dates
%disp('Epochs')
epoch = numeric(1:5844);      % Vector of Object Epochs in TDB
%disp('Eccentricity')
EC = numeric(5845:11688);     % Vector of Eccentricities
%disp('Periapsis Distance in AUs')
QR = numeric(11689:17532);    % Vector of Periapsis Distance in AU's
%disp('Inclination in Degrees')
IN = numeric(17533:23376);    % Vector of Inclinations in Degrees
%disp('Longitude of the Ascending Node in Degrees')
OM = numeric(23377:29220);    % Vector of Longitudes of Ascending Node in Degrees
%disp('Argument of Perigee in Degrees')
W = numeric(29221:35064);     % Vector of Arguments of Perigee in Degrees
%disp('Time of Periapsis relative to Epoch (P-E) in Days')
Tp = numeric(35065:40908);    % Vector of Times of Periapsis relative to Epoch in
Days
%disp('Mean Motion in Degrees/Day')
N = numeric(40909:46752);     % Vector of Mean Motions in Degrees/Day
%disp('Mean Anamoly in Degrees')
MA = numeric(46753:52596);    % Vector of Mean Anamolies in Degrees
%disp('True Anamoly in Degrees')
TA = numeric(52597:58440);    % Vector of True Anamolies in Degrees
%disp('Semi-Major Axis in AUs')
A = numeric(58441:64284);     % Vector of Semi-Major Axes in AU's
%disp('Apoapsis Distance in AUs')
AD = numeric(64285:70128);    % Vector of Apoapsis Distances in AU's
%disp('Orbital Period in Days')
PR = numeric(70129:75972);    % Vector of Orbital Periods in Days

i = 1;
diff = 1;
while diff > 0
    diff = jd - epoch(i);
    i = i+1;
end
q = i-1;

eccen = EC(q);
peridist = QR(q);
incl = IN(q);
lan = OM(q);
periarg = W(q);
meanmo = N(q);
meananom = MA(q);
trueanom = TA(q);
semimaj = A(q);
apodist = AD(q);

```

```

period = PR(q);
JDCT = epoch(q);
peritime = Tp(q);
end

```

Pluto

```

function
[eccen,peridist,incl,lan,periarg,meanmo,meananom,semimaj,apodist,period,trueanom] =
findpluto(year,month,day)
%findpluto finds the location of Pluto in the Sun-centered Heliocentric
%Ecliptic plane between 01 Jan 10 to 31 Dec 25

% Coordinate system description:
%
%   Ecliptic and Mean Equinox of Reference Epoch
%
%   Reference epoch: J2000.0
%   xy-plane: plane of the Earth's orbit at the reference epoch
%   x-axis   : out along ascending node of instantaneous plane of the Earth's
%               orbit and the Earth's mean equator at the reference epoch
%   z-axis   : perpendicular to the xy-plane in the directional (+ or -) sense
%               of Earth's north pole at the reference epoch.
%
% Symbol meaning [1 AU=149597870.691 km, 1 day=86400.0 s]:
%
%   JDCT      Epoch Julian Date, Coordinate Time
%   EC        Eccentricity, e
%   QR        Periapsis distance, q (AU)
%   IN        Inclination w.r.t xy-plane, i (degrees)
%   OM        Longitude of Ascending Node, OMEGA, (degrees)
%   W         Argument of Perifocus, w (degrees)
%   Tp        Time of periapsis relative to epoch (P-E) (day)
%   N         Mean motion, n (degrees/day)
%   MA        Mean anomaly, M (degrees)
%   TA        True anomaly, nu (degrees)
%   A         Semi-major axis, a (AU)
%   AD        Apoapsis distance (AU)
%   PR        Orbital period (day)

jd = jday(year, month, day, 0, 0, 0);

[numeric txt] = xlsread('Pluto(06Dec09).xlsx',2);
%disp('Dates')
date = txt(1:5844);           % Vector of Object Dates
%disp('Epochs')
epoch = numeric(1:5844);      % Vector of Object Epochs in TDB
%disp('Eccentricity')
EC = numeric(5845:11688);     % Vector of Eccentricities
%disp('Periapsis Distance in AUs')
QR = numeric(11689:17532);    % Vector of Periapsis Distance in AU's
%disp('Inclination in Degrees')
IN = numeric(17533:23376);    % Vector of Inclinations in Degrees
%disp('Longitude of the Ascending Node in Degrees')
OM = numeric(23377:29220);    % Vector of Longitudes of Ascending Node in Degrees
%disp('Argument of Perigee in Degrees')
W = numeric(29221:35064);     % Vector of Arguments of Perigee in Degrees
%disp('Time of Periapsis relative to Epoch (P-E) in Days')
Tp = numeric(35065:40908);    % Vector of Times of Periapsis relative to Epoch in
Days
%disp('Mean Motion in Degrees/Day')
N = numeric(40909:46752);     % Vector of Mean Motions in Degrees/Day
%disp('Mean Anomaly in Degrees')
MA = numeric(46753:52596);    % Vector of Mean Anomalies in Degrees
%disp('True Anomaly in Degrees')
TA = numeric(52597:58440);    % Vector of True Anomalies in Degrees
%disp('Semi-Major Axis in AUs')
A = numeric(58441:64284);     % Vector of Semi-Major Axes in AU's

```

```

%disp('Apoapsis Distance in AUs')
AD = numeric(64285:70128); % Vector of Apoapsis Distances in AU's
%disp('Orbital Period in Days')
PR = numeric(70129:75972); % Vector of Orbital Periods in Days

i = 1;
diff = 1;
while diff > 0
    diff = jd - epoch(i);
    i = i+1;
end
q = i-1;

eccen = EC(q);
peridist = QR(q);
incl = IN(q);
lan = OM(q);
periarg = W(q);
meanmo = N(q);
meananom = MA(q);
trueanom = TA(q);
semimaj = A(q);
apodist = AD(q);
period = PR(q);
JDCT = epoch(q);
peritime = Tp(q);
end

```

Appendix G: Other Supporting Matlab Code

Angle Between Two Vectors

```

%                               function angl
%
%  this function calculates the angle between two vectors.  the output is
%  set to 999999.1 to indicate an undefined value.  be sure to check for
%  this at the output phase.
%
%  author      : david vallado                  719-573-2600    27 may 2002
%
%  revisions
%    vallado   - fix tolerances                  5 sep 2002
%
%  inputs      description                      range / units
%    vec1      - vector number 1
%    vec2      - vector number 2
%
%  outputs     :
%    theta     - angle between the two vectors  -pi to pi
%
%  locals      :
%    temp      - temporary real variable
%
%  coupling     :
%
%  [theta] = angl ( vec1,vec2 );
% ----- }
function [theta] = angl ( vec1,vec2 );

    small      = 0.00000001;
    undefined = 999999.1;

```

```

magv1 = mag(vec1);
magv2 = mag(vec2);

if magv1*magv2 > small^2
    temp= dot(vec1,vec2) / (magv1*magv2);
    if abs( temp ) > 1.0
        temp= sign(temp) * 1.0;
    end
    theta= acos( temp );
else
    theta= undefined;
end

```

Constants

```

%                               function constastro
%
% this function sets constants for various astrodynamic operations.
%
% author      : david vallado              719-573-2600    2 apr 2007
%
% revisions
%
% inputs      : description                  range / units
% none
%
% outputs     :
% re, flat, omegaearth, mu;
% eccearth, eccearthsgd;
% renm, reft, tusec, tumin, today, omegaearthradptu, omegaearthradpmin;
% velkmps, velftps, velradpmin;
% degpsec, radpday;
% speedoflight, au, earth2moon, moonradius, sunradius;
%
% locals      :
% -
%
% coupling    :
% none.
%
% constastro;
% -----
%
% constmath;
%
% ----- physical constants -----
% WGS-84/EGM-96 constants used here
re      = 6378.137;           % km
flat    = 1.0/298.257223563;
omegaearth = 7.292115e-11;    % rad/s
mu      = 398600.4418;        % km3/s2
mum     = 3.986004418e14;     % m3/s2
%
% derived constants from the base values
eccearth = sqrt(2.0*flat - flat^2);
eccearthsgd = eccearth^2;
%
renm = re / nm2m;
reft = re * 1000.0 / ft2m;
%
tusec = sqrt(re^3/mu);
tummin = tusec / 60.0;
today = tusec / 86400.0;
%
omegaearthradptu = omegaearth * tusec;
omegaearthradpmin = omegaearth * 60.0;

```

```

    velkmps = sqrt(mu / re);
    velftps = velkmps * 1000.0/ft2m;
    velradpmin = velkmps * 60.0/re;
%for afspc
%velkmps1 = velradpmin*6378.135/60.0    7.90537051051763
%mul = velkmps*velkmps*6378.135    3.986003602567418e+005
    degpsec = (180.0 / pi) / tusec;
    radpday = 2.0 * pi * 1.002737909350795;

    speedoflight = 2.99792458e8; % m/s
    au = 149597870.0; % km
    earth2moon = 384400.0; % km
    moonradius = 1738.0; % km
    sunradius = 696000.0; % km

    masssun = 1.9891e30;
    massearth = 5.9742e24;
    massmoon = 7.3483e22;

```

Constants for Mathematical Operations

```

%                               function constmath
%
% this function sets constants for mathematical operations.
%
% author      : david vallado              719-573-2600    2 apr 2007
%
% revisions
%
% inputs      : description                  range / units
%   none
%
% outputs     :
%   rad, twopi, halfpi;
%   ft2m, mile2m, nm2m, mile2ft, mileph2kmph, nmph2kmph;
%
% locals      :
%   -
%
% coupling     :
%   none.
%
% constmath;
% -----

    small = 0.00000001;

    infinite = 999999.9;
    undefined = 999999.1;

% ----- mathematical -----
    rad = 180.0 / pi;
    twopi = 2.0 * pi;
    halfpi = pi * 0.5;

% ----- conversions -----
    ft2m = 0.3048;
    mile2m = 1609.344;
    nm2m = 1852;
    mile2ft = 5280;
    mileph2kmph = 0.44704;
    nmph2kmph = 0.5144444;

```


Day Converter

```
%
%                                     function days2mdh
%
% this function converts the day of the year, days, to the equivalent month
% day, hour, minute and second.
%
% author          : david vallado              719-573-2600    22 jun 2002
%
% revisions
% -
%
% inputs          description                  range / units
%   year          - year                      1900 .. 2100
%   days          - julian day of the year    0.0  .. 366.0
%
% outputs         :
%   mon           - month                     1 .. 12
%   day           - day                      1 .. 28,29,30,31
%   hr            - hour                     0 .. 23
%   minute        - minute                   0 .. 59
%   sec           - second                   0.0 .. 59.999
%
% locals         :
%   dayofyr       - day of year
%   temp          - temporary extended values
%   inttemp       - temporary integer value
%   i             - index
%   lmonth(12)    - integer array containing the number of days per month
%
% coupling       :
%   none.
%
% [mon,day,hr,minute,sec] = days2mdh ( year,days);
% -----

function [mon,day,hr,minute,sec] = days2mdh ( year,days);

% ----- set up array of days in month -----
for i= 1 : 12
    lmonth(i) = 31;
    if i == 2
        lmonth(i)= 28;
    end;
    if i == 4 | i == 6 | i == 9 | i == 11
        lmonth(i)= 30;
    end;
end

dayofyr= floor(days );

% ----- find month and day of month -----
if rem(year-1900,4) == 0
    lmonth(2)= 29;
end

i= 1;
inttemp= 0;
while ( dayofyr > inttemp + lmonth(i) ) & ( i < 12 )
    inttemp= inttemp + lmonth(i);
    i= i+1;
end

mon= i;
day= dayofyr - inttemp;
```

```

% ----- find hours minutes and seconds -----
temp= (days - dayofyr )*24.0;
hr = fix( temp );
temp= (temp-hr) * 60.0;
minute = fix( temp );
sec = (temp-minute) * 60.0;

```

Inverse Julian Day

```

%                                     function invjday
%
% this function finds the year, month, day, hour, minute and second
% given the julian date. tu can be ut1, tdt, tdb, etc.
%
% author      : david vallado                  719-573-2600   27 may 2002
%
% revisions
%
%
% inputs      description                      range / units
%   jd        - julian date                    days from 4713 bc
%
% outputs     :
%   year      - year                          1900 .. 2100
%   mon       - month                         1 .. 12
%   day       - day                          1 .. 28,29,30,31
%   hr        - hour                         0 .. 23
%   min       - minute                       0 .. 59
%   sec       - second                       0.0 .. 59.999
%
% locals      :
%   days      - day of year plus fractional    days
%               portion of a day
%   tu        - julian centuries from 0 h
%               jan 0, 1900
%   temp      - temporary real values
%   leapyrs   - number of leap years from 1900
%
% coupling    :
%   days2mdhms - finds month, day, hour, minute and second given days and year
%
% references   :
%   vallado    2007, 208, alg 22, ex 3-13
%
% [year,mon,day,hr,min,sec] = invjday ( jd );
% -----

function [year,mon,day,hr,min,sec] = invjday ( jd );

% ----- find year and days of the year -----
temp = jd-2415019.5;
tu = temp / 365.25;
year = 1900 + floor( tu );
leapyrs= floor( ( year-1901 )*0.25 );
%   days = temp - ((year-1900)*365.0 + leapyrs ) + 0.00000000001; % nudge by 8.64x10-
7 sec to get even outputs
days = temp - ((year-1900)*365.0 + leapyrs );

% ----- check for case of beginning of a year -----
if days < 1.0
    year = year - 1;
    leapyrs= floor( ( year-1901 )*0.25 );
    days = temp - ((year-1900)*365.0 + leapyrs );
end

% ----- find remaining data -----
[mon,day,hr,min,sec] = days2mdh( year,days );
%   sec= sec - 0.00000086400;

```

Julian Day

```
%
%                               function jday.m
%
% this function finds the julian date given the year, month, day, and time.
%
% author      : david vallado              719-573-2600    27 may 2002
%
% revisions
%
%
% inputs      description                  range / units
%   year      - year                      1900 .. 2100
%   mon       - month                     1 .. 12
%   day       - day                       1 .. 28,29,30,31
%   hr        - universal time hour       0 .. 23
%   min       - universal time min        0 .. 59
%   sec       - universal time sec        0.0 .. 59.999
%   whichtype - julian .or. gregorian calender 'j' .or. 'g'
%
% outputs     :
%   jd        - julian date                days from 4713 bc
%
% locals      :
%   none.
%
% coupling    :
%   none.
%
% references   :
%   vallado   2007, 189, alg 14, ex 3-14
%
% jd = jday(yr, mon, day, hr, min, sec)
% -----
function jd = jday(yr, mon, day, hr, min, sec)

% ----- implementation -----
jd = 367.0 * yr ...
    - floor( (7 * (yr + floor( (mon + 9) / 12.0) ) ) * 0.25 ) ...
    + floor( 275 * mon / 9.0 ) ...
    + day + 1721013.5 ...
    + ( (sec/60.0 + min) / 60.0 + hr ) / 24.0;
% - 0.5 * sign(100.0 * yr + mon - 190002.5) + 0.5;
```

Newton's Method

```
%
%                               function newtonm
%
% this function performs the newton raphson iteration to find the
% eccentric anomaly given the mean anomaly. the true anomaly is also
% calculated.
%
% author      : david vallado              719-573-2600    9 jun 2002
%
% revisions
%
%
% inputs      description                  range / units
%   ecc       - eccentricity              0.0 to
%   m         - mean anomaly              -2pi to 2pi rad
%
% outputs     :
%   e0        - eccentric anomaly         0.0 to 2pi rad
%   nu        - true anomaly              0.0 to 2pi rad
%
% locals      :
```

```

% e1          - eccentric anomaly, next value  rad
% sinv        - sine of nu
% cosv        - cosine of nu
% ktr         - index
% rlr         - cubic roots - 1 to 3
% rli         - imaginary component
% r2r         -
% r2i         -
% r3r         -
% r3i         -
% s           - variables for parabolic solution
% w           - variables for parabolic solution
%
% coupling    :
%   cubic     - solves a cubic polynomial
%
% references  :
%   vallado   2001, 72-75, alg 2, ex 2-1
%
% [e0,nu] = newtonm ( ecc,m );
% -----

function [e0,nu] = newtonm ( ecc,m );

% ----- implementation -----
numiter = 50;
small = 0.00000001;
halfpi = pi * 0.5;

% ----- hyperbolic -----
if ( (ecc-1.0) > small )
% ----- initial guess -----
    if ( ecc < 1.6 )
        if ( ((m<0.0) & (m>-pi)) | (m>pi) )
            e0 = m - ecc;
        else
            e0 = m + ecc;
        end
    else
        if ( (ecc < 3.6) & (abs(m) > pi) )
            e0 = m - sign(m)*ecc;
        else
            e0 = m/(ecc-1.0);
        end
    end
    ktr = 1;
    e1 = e0 + ( (m-ecc*sinh(e0)+e0) / (ecc*cosh(e0) - 1.0) );
    while ( (abs(e1-e0)>small) & (ktr<=numiter) )
        e0 = e1;
        e1 = e0 + ( (m - ecc*sinh(e0) + e0) / (ecc*cosh(e0) - 1.0) );
        ktr = ktr + 1;
    end
% ----- find true anomaly -----
    sinv = -( sqrt( ecc*ecc-1.0 ) * sinh(e1) ) / ( 1.0 - ecc*cosh(e1) );
    cosv = ( cosh(e1) - ecc ) / ( 1.0 - ecc*cosh(e1) );
    nu = atan2( sinv,cosv );
else
% ----- parabolic -----
    if ( abs( ecc-1.0 ) < small )
        c = [ 1.0/3.0; 0.0; 1.0; -m];
        [rlr] = roots (c);
        e0 = rlr;
        s = 0.5 * (halfpi - atan( 1.5 *m ) );
        w = atan( tan( s )^(1.0 /3.0) );
        e0 = 2.0 *cot(2.0 *w);
        ktr = 1;
        nu = 2.0 * atan(e0);
    else
% ----- elliptical -----

```

```

if ( ecc > small )
    % ----- initial guess -----
    if ( ((m < 0.0 ) & (m > -pi)) | (m > pi) )
        e0= m - ecc;
    else
        e0= m + ecc;
    end
    ktr= 1;
    e1 = e0 + ( m - e0 + ecc*sin(e0) ) / ( 1.0 - ecc*cos(e0) );
    while ( ( abs(e1-e0) > small ) & ( ktr <= numiter ) )
        ktr = ktr + 1;
        e0= e1;
        e1= e0 + ( m - e0 + ecc*sin(e0) ) / ( 1.0 - ecc*cos(e0) );
    end
    % ----- find true anomaly -----
    sinv= ( sqrt( 1.0 -ecc*ecc ) * sin(e1) ) / ( 1.0 -ecc*cos(e1) );
    cosv= ( cos(e1)-ecc ) / ( 1.0 - ecc*cos(e1) );
    nu = atan2( sinv,cosv );
else
    % ----- circular -----
    ktr= 0;
    nu= m;
    e0= m;
end
end
end

```

P-Iteration

```

function [nsoln,v1,v2] = piter(r1,r2,tdays,iway,nrev)

% piter Uses an iteration method to solve the two position vector and time
% of flight problem
%
% piter function has been translated from BASIC code written by Dr. William Wiesel
% Translated by Captain Barry Witt August 2008
%
% [nsoln,v1,v2]=piter(r1,r2,tdays,iway,nrev)
%
% P iteration method, ref Bate, Mueller & White section 5.4
% ELLIPSES ONLY
% units are DU's, TU's, although input, t, is in days
% W. Wiesel, AFIT/ENY, November 1998
% BM&W refers to Bate, Mueller & White, "Fundamental of Astrodynamics"
%
% NOTE:Piter does not work with colinear position vectors, despite a time
% difference between them.
%
% Outputs definitions
% nsoln - number of solutions found: 0 if it fails, 1 if it found 1
%         solution (usually < 1 rev case), or 2 solutions found (for > 1 rev case)
% v1(i,isoln) - initial velocity vector, DU/TU, isoln = 1 or 2. This is
% the velocity required at launch, or burn. In the same frame as r1 and
% r2.
% v2(i,isoln) - final velocity vector, isoln = 1 or 2. This is the
% velocity of the inteceptor at the interception point
%
% Inputs definitions
% r1 - the position vector of the interceptor at the initial time, in DU,
% in ECEF frame
% r2 - the position vector at the requested point of interception, in DU,
% in ECEF frame
% tdays is elapsed time of flight, in days
% iway = 0 for "short way", else for "long way"
% nrev = number of whole revolutions, 0 if <1. Note: This is chosen
% independently of tof

% Constants from www.celestrak.com code

```

```

% speedoflight      = 2.99792458e8;          % m/s
au                  = 149597870.691;          % km
% moonradius        = 1738.0;                % km
% sunradius         = 696000.0;              % km
% masssun           = 1.9891e30;              % kg
% massearth         = 5.9742e24;              % kg
% massmoon          = 7.3483e22;              % kg
re                  = 6378.137;                % km
% flat              = 1.0/298.257223563;
% omegaeearth       = 7.292115e-11;           % rad/s
mu                  = 398600.4418;             % km3/s2
% mum               = 3.986004418e14;         % m3/s2
% % Constants from http://www.planck.com/heliocentric.htm
musunm              = 1.32712440018e20;       % m3/s2
musunkm              = musunm/(1000^3);        % km3/s2
musunau              = musunkm*((86400^2)/(au^3)); % au3/day2
TU2day               = 58.132821;              % Days
TU2s                 = 5.0226757*10^6;         % Seconds
SU                   = 29.784852;              % Km/s

xmu=1;

%calculate some preliminaries

nsoln=0;

t = tdays/TU2day;          %convert time of flight from days to TU
rone=mag(r1);
rtwo=mag(r2);
cosdnu=dot(r1,r2)/(rone*rtwo);

%colinear case won't converge

if cosdnu>0.985
    %disp('Position vectors are colinear in the same direction. Piter terminating.')
    nsoln=0;v1=[NaN;NaN;NaN];v2=[NaN;NaN;NaN]; %i have chosen NaN as the error return
value
    return
elseif cosdnu<-0.995
    %disp('Position vectors are colinear in the opposite direction. Piter terminating')
    nsoln=0;v1=[NaN;NaN;NaN];v2=[NaN;NaN;NaN];
    return
end

% Three auxillary quantities, BM&W 5.4-4

xk=rone*rtwo*(1-cosdnu);
xl=rone+rtwo;
xm=rone*rtwo*(1+cosdnu);

% Parabolic limiting values for parameter p, BM&W 5.4-14, -15

pM=xk/(xl+sqrt(2*xm));
pp=xk/(xl-sqrt(2*xm));

%calculate discriminant for p limits, Denominator of BM&W 5.4-8

disc=4*xk*xk*xl*xl+4*xk*xk*(2*xm-xl*xl);

if disc<0 %no elliptic solutions
    %disp('There are no elliptic solutions. Piter terminating')
    nsoln=0;v1=[NaN;NaN;NaN];v2=[NaN;NaN;NaN];
    return
end

%BRANCH ON NUMBER OF EXPECTED SOLUTIONS

if nrev<eps

```

```

% less than one rev case: this is the case explicitly covered in BM&W.
% only one solution each way (short or long) is expected.

% opening strategy: bisection, 10X, start just inside parabolic limits

del=0.000001;
plow=pM+del;
phi=pp-del;

[toflo,dtdp]=tofp(plow,rone,rtwo,cosdnu,xk,xl,xm,iway,nrev,0);
if isnan(toflo) %this code stops piter if tofp returns NaN for tof
    nsoln=0;v1=[NaN;NaN;NaN];v2=[NaN;NaN;NaN];
    return
end
[tofhi,dtdp]=tofp(phi,rone,rtwo,cosdnu,xk,xl,xm,iway,nrev,0);
if isnan(tofhi)
    nsoln=0;v1=[NaN;NaN;NaN];v2=[NaN;NaN;NaN];
    return
end

for i=1:10 %bisect
    p=(plow+phi)/2;
    [tof,dtdp]=tofp(p,rone,rtwo,cosdnu,xk,xl,xm,iway,nrev,1); %decide which
    if isnan(tof)
        nsoln=0;v1=[NaN;NaN;NaN];v2=[NaN;NaN;NaN];
        return
    end
    if (t-toflo)*(t-tof)<0 %low half brackets root
        phi=p;
        tofhi=tof;
    else %root is in upper half
        plow=p;
        toflo=tof;
    end
end

%see if we are still pegged at one limit, and therefore never
%converged....

if (abs(p-pM-del)<0.0000000001) || (abs(p-pp+del)<0.0000000001)
    %disp('There was no convergence on the solution. Piter terminating.')
    nsoln=0;v1=[NaN;NaN;NaN];v2=[NaN;NaN;NaN]; %no convergence
    return
end

%endgame: Newton-Rhapson loop

for i=1:10
    imode=1;
    [tof,dtdp]=tofp(p,rone,rtwo,cosdnu,xk,xl,xm,iway,nrev,imode);
    if isnan(tof)
        nsoln=0;v1=[NaN;NaN;NaN];v2=[NaN;NaN;NaN];
        return
    end
    dt=tof-t;
    dp=-dt/dtdp;
    p=p+dp;
    if abs(dp)<0.0000000001
        break
    end
end

%didn't converge...check value of tof
if (abs(t-tof))>0.00000001
    %disp('The difference between time requested and tof found was too big, piter is
stopping.')
    nsoln=0;v1=[NaN;NaN;NaN];v2=[NaN;NaN;NaN];
    return
end

```

```

%final processing: get v1 and v2
%calculate f & g functions, BM&W 5.2-3 thru 5.2-6

f=1-rtwo*(1-cosdnu)/p;
if iway<eps %short way
    sindnu=sqrt(1-cosdnu*cosdnu);
else
    sindnu=-sqrt(1-cosdnu*cosdnu);
end

g=(rone*rtwo*sindnu)/sqrt(xmu*p);
fdot=sqrt(xmu/p)*((1-cosdnu)/sindnu)*((1-cosdnu)/p-1/rone-1/rtwo);
gdot=1-rone*(1-cosdnu)/p;

for i=1:3
    v1(i,1)=((r2(i)-f*r1(i))/g);
    v2(i,1)=(fdot*r1(i)+gdot*v1(i,1));
end

%declare success with one solution found
nsoln=1;

else

    %Multirev case: two solutions expected. This case is not explicitly
    %covered in BM&W. The modifications for the multirev case are called
    %out in the code where they occur. Mostly in the evaluation of time of
    %flight (tofp function). Experimentation shows two solutions are
    %expected between the parabolic limits of pm and pp.

    %get initial approximations to both solutions by scanning p interval

    del=0.000001;
    plow=pM+del;
    phi=pp-del;

    pguess(1)=0;
    pguess(2)=0;
    tprev=0;
    nroots=0;
    for i=1:200
        p=plow*(200-i)/199+phi*(i-1)/199;
        [tof,dt dp]=tofp(p,rone,rtwo,cosdnu,xk,xl,xm,iway,nrev,0);
        if isnan(tof)
            nsoln=0;v1=[NaN;NaN;NaN];v2=[NaN;NaN;NaN];
            return
        end
        if tprev<eps
            tprev=tof;
        else
            if (tof-tprev)*(tprev-t)<0 %we've bracked a root...which one?
                if pguess(1)<eps
                    pguess(1)=p;
                    nroots=1;
                else
                    pguess(2)=p;
                    nroots=2;
                    break
                end
            end
            tprev=tof;
        end
    end

    %both roots were not found

    if nroots<eps
        %disp('Unable to find both roots in piter.')
    end
end

```



```

        nsoln=0;v1=[NaN;NaN;NaN];v2=[NaN;NaN;NaN];
        return
    end

    %loop on solutions found.

    for ir=1:nroots %endgame: Newton-Rhapson loop
        for i=1:10
            imode=1;
            [tof,dtdp]=tofp(pguess(ir),rone,rtwo,cosdnu,xk,xl,xm,iway,nrev,imode);
            if isnan(tof)
                nsoln=0;v1=[NaN;NaN;NaN];v2=[NaN;NaN;NaN];
                return
            end
            dt=tof-t;
            dp=-dt/dtdp;

            pguess(ir)=pguess(ir)+dp;
            %check for negative p....abort
            if pguess(ir)<0
                break
            end
            if abs(dp)<0.0000000001
                break
            end
        end
        if pguess(ir)<0 %in Basic if this is true, the next ir loop goes through
            nsoln=nsoln+1; %if it skips an ir loop, the code needs nsoln to be
advanced
        else

            % final processing: get v1 and v2. calculate f & g functions, BM&W
            % 5.2-3 thru 5.2-6
            f=1-rtwo*(1-cosdnu)/pguess(ir);
            if iway<eps %short way
                sindnu=sqrt(1-cosdnu*cosdnu);
            else
                sindnu=-sqrt(1-cosdnu*cosdnu);
            end
            g=rone*rtwo*sindnu/sqrt(xmu*pguess(ir));
            fdot=sqrt(xmu/pguess(ir))*((1-cosdnu)/sindnu)*((1-cosdnu)/pguess(ir)-1/rone-
1/rtwo);
            gdot=1-rone*(1-cosdnu)/pguess(ir);
            nsoln=nsoln+1;
            for i=1:3
                v1(i,nsoln)=((r2(i)-f*r1(i))/g);
                v2(i,nsoln)=(fdot*r1(i)+gdot*v1(i,ir));
            end

        end
    end

    %end <1 rev/multirev if block
end

```

Position and Velocity Vectors to Classical Orbital Elements

```

%                                     function rv2coe
%
% this function finds the classical orbital elements given the geocentric
% equatorial position and velocity vectors.
%
% author          : david vallado              719-573-2600    21 jun 2002
%
% revisions

```

```

%   vallado      - fix special cases                                5 sep 2002
%   vallado      - delete extra check in inclination code          16 oct 2002
%   vallado      - add constant file use                            29 jun 2003
%   vallado      - add mu                                           2 apr 2007
%
% inputs          description                                     range / units
%   r             - ijk position vector                           km
%   v             - ijk velocity vector                           km / s
%   mu            - gravitational parameter                       km3 / s2
%
% outputs         :
%   p             - semilatus rectum                               km
%   a             - semimajor axis                                 km
%   ecc           - eccentricity
%   incl          - inclination                                    0.0 to pi rad
%   omega         - longitude of ascending node                   0.0 to 2pi rad
%   argp          - argument of perigee                           0.0 to 2pi rad
%   nu            - true anomaly                                  0.0 to 2pi rad
%   m             - mean anomaly                                  0.0 to 2pi rad
%   arglat        - argument of latitude (ci) 0.0 to 2pi rad
%   truelon       - true longitude (ce) 0.0 to 2pi rad
%   lonper        - longitude of periapsis (ee) 0.0 to 2pi rad
%
% locals         :
%   hbar          - angular momentum h vector                     km2 / s
%   ebar          - eccentricity e vector
%   nbar          - line of nodes n vector
%   cl            - v**2 - u/r
%   rdotv         - r dot v
%   hk            - hk unit vector
%   sme           - specific mechanical energy                     km2 / s2
%   i             - index
%   e             - eccentric, parabolic,
%                  hyperbolic anomaly                             rad
%   temp          - temporary variable
%   typeorbit     - type of orbit                                  ee, ei, ce, ci
%
% coupling       :
%   mag           - magnitude of a vector
%   angl          - find the angl between two vectors
%   newtonnu      - find the mean anomaly
%
% references     :
%   vallado       2007, 121, alg 9, ex 2-5
%
% [p,a,ecc,incl,omega,argp,nu,m,arglat,truelon,lonper ] = rv2coe (r,v,mu);
% -----
function [p,a,ecc,incl,omega,argp,nu,m,arglat,truelon,lonper ] = rv2coe (r,v,mu);

    constmath;
    constastro;

    % ----- implementation -----
    magr= mag( r );
    magv= mag( v );
    % ----- find h n and e vectors -----
    [hbar] = cross( r,v );
    magh= mag( hbar );
    if ( magh > small )
        nbar(1)= -hbar(2);
        nbar(2)= hbar(1);
        nbar(3)= 0.0;
        magn = mag( nbar );
        cl = magv*magv - mu /magr;
        rdotv= dot( r,v );
        for i= 1 : 3
            ebar(i)= (cl*r(i) - rdotv*v(i))/mu;
        end

```

```

ecc = mag( ebar );

% ----- find a e and semi-latus rectum -----
sme= ( magy*magy*0.5 ) - ( mu /magr );
if ( abs( sme ) > small )
    a= -mu / (2.0 *sme);
else
    a= infinite;
end
p = magh*magh/mu;

% ----- find inclination -----
hk= hbar(3)/magh;
incl= acos( hk );

% ----- determine type of orbit for later use -----
% ----- elliptical, parabolic, hyperbolic inclined -----
typeorbit= 'ei';
if ( ecc < small )
    % ----- circular equatorial -----
    if ( incl<small ) | (abs(incl-pi)<small)
        typeorbit= 'ce';
    else
        % ----- circular inclined -----
        typeorbit= 'ci';
    end
else
    % - elliptical, parabolic, hyperbolic equatorial --
    if ( incl<small ) | (abs(incl-pi)<small)
        typeorbit= 'ee';
    end
end

% ----- find longitude of ascending node -----
if ( magn > small )
    temp= nbar(1) / magn;
    if ( abs(temp) > 1.0 )
        temp= sign(temp);
    end
    omega= acos( temp );
    if ( nbar(2) < 0.0 )
        omega= twopi - omega;
    end
else
    omega= undefined;
end

% ----- find argument of perigee -----
if ( typeorbit == 'ei' )
    argp = angl( nbar,ebar);
    if ( ebar(3) < 0.0 )
        argp= twopi - argp;
    end
else
    argp= undefined;
end

% ----- find true anomaly at epoch -----
if ( typeorbit(1:1) == 'e' )
    nu = angl( ebar,r);
    if ( rdotv < 0.0 )
        nu= twopi - nu;
    end
else
    nu= undefined;
end

% ---- find argument of latitude - circular inclined ----
if ( typeorbit == 'ci' )

```

```

        arglat = angl( nbar,r );
        if ( r(3) < 0.0 )
            arglat= twopi - arglat;
        end
        m = arglat;
    else
        arglat= undefined;
    end

% -- find longitude of perigee - elliptical equatorial ----
if ( ecc>small ) & (typeorbit=='ee')
    temp= ebar(1)/ecc;
    if ( abs(temp) > 1.0 )
        temp= sign(temp);
    end
    lonper= acos( temp );
    if ( ebar(2) < 0.0 )
        lonper= twopi - lonper;
    end
    if ( incl > halfpi )
        lonper= twopi - lonper;
    end
else
    lonper= undefined;
end

% ----- find true longitude - circular equatorial -----
if ( magr>small ) & ( typeorbit=='ce' )
    temp= r(1)/magr;
    if ( abs(temp) > 1.0 )
        temp= sign(temp);
    end
    truelon= acos( temp );
    if ( r(2) < 0.0 )
        truelon= twopi - truelon;
    end
    if ( incl > halfpi )
        truelon= twopi - truelon;
    end
    m = truelon;
else
    truelon= undefined;
end

% ----- find mean anomaly for all orbits -----
if ( typeorbit(1:1) == 'e' )
    [e,m] = newtonnu(ecc,nu );
end

else
    p = undefined;
    a = undefined;
    ecc = undefined;
    incl = undefined;
    omega= undefined;
    argp = undefined;
    nu = undefined;
    m = undefined;
    arglat = undefined;
    truelon= undefined;
    lonper = undefined;
end
end

```

Time of Flight

```
function [tof,dtofdp] = tofp(p,rone,rtwo,cosdnu,xk,xl,xm,iway,nrev,imode)
```

%tofp function has been translated from BASIC code written by Dr. William Wiesel.

```

%Translated by Captain Barry Witt August 2008.
%
%This calculates time of flight, tof, from supposed value p value for p iteration
%method. In addition this calculates dt/dp if imode ??? 0.
%Original code written by W. Wiesel, AFIT/ENY, Nov 1998. "BM&W" refers to
%Bate, Mueller, and White, "Fundamentals of Astrodynamics", Dover.
%
%Outputs are tof,dtofdp. Inputs are p,rone,rtwo,cosdnu,xk,xl,xm,iway,nrev,imode.
%
%Outputs definitions
%tof - time of flight in TU units
%dtofdp - rate of change of tof w.r.t. p
%
%Inputs definitions
%p - semi-latus rectum in ??? units
%rone - magnitude of the position vector of first satellite in ??? units
%rtwo - magnitude of the position vector of the second satellite in ??? units
%cosdnu - cosine of the angle between the two position vectors.
%xk - constant defined in BM&W
%xl - constant defined in BM&W
%xm - constant defined in BM&W
%iway - short/long way determination. 0 is short, else is long.
%nrev - number of revolutions. 0 is less than one case covered in BM&W.
%Note: this is chosen independently of tof
%Else is developed in the code.
%imode - if this is equal to zero then code only calculates tof.

au = 149597870.691; % km
musunm = 1.32712440018e20; % m3/s2
musunkm = musunm/(1000^3); % km3/s2
musunau = musunkm*((86400^2)/(au^3)); % au3/day2
TU2day = 58.132821; % Days
TU2s = 5.0226757*10^6; % Seconds
SU = 29.784852; % Km/s

xmu=1;

a=(xm*xk*p)/((2*xm-xl*xl)*p*p+2*xk*xl*p-xk*xk); %calculate semimajor axis a, BM&W 5.4-8

if a<0
    %disp('Accidental hyperbolic orbit')
    tof=NaN;
    dtofdp=NaN;
    return
end

%calculate f, fdot, g: BM&W 5.2-3, 5.2-5, 5.2-4

f=1-rtwo*(1-cosdnu)/p;
if iway<eps %short way
    sindnu=sqrt(1-cosdnu*cosdnu);
else
    sindnu=-sqrt(1-cosdnu*cosdnu);
end

if p<0
    %disp('p is negative.')
    tof=NaN;
    dtofdp=NaN;
    return
end

g = (rone*rtwo*sindnu)/sqrt(xmu*p);
fdot = sqrt(xmu/p)*((1-cosdnu)/sindnu)*((1-cosdnu)/p-1/rone-1/rtwo); % Using tan(dnu/2) =
((1-cosdnu)/sindnu)

%change in eccentric anomaly, BM&W 5.4-9, 5.4-10

cosdE = 1-rone*(1-f)/a;

```

```

sindE = (-rone*rtwo*fdot)/sqrt(xmu*a);
dE = acos(cosdE);

if sindE<0
    dE=2*pi-dE;
end

%ensure dE within 0-1 rev

if dE<0
    dE=dE+2*pi;
end

if dE>2*pi
    dE=dE-2*pi;
end

%add multiple revs to eccentric anomaly...required extension not in BM&W

dE=dE+2*pi*nrev;

%time of flight, BM&W 5.4-12

tof=g+sqrt((a*a*a)/xmu)*(dE-sindE);

if imode<eps
    dtofdP=NaN;
    return
end

%calculate dt/dp

%less-than-one rev derivative, BM&W 5.4-22

dtofdP=-g/(2*p)-1.5*a*(tof-sqrt(a*a*a)*2*pi*nrev-g)*((xk*xk+(2*xm-
xl*xl)*p*p)/(xm*xk*p*p))+sqrt((a*a*a)/xmu)*((2*xk*sindE)/(p*(xk-xl*p)));

%correction for multiple revs...nrev*d(DeltaE = 2 n pi)/da*da/dp

%NEEDS MU FIX

if nrev>0
    dtofdP=dtofdP-3*nrev*pi*sqrt(a*a*a*a*a)*((xk*xk+(2*xm-xl*xl)*p*p)/(xm*xk*p*p));
end

```

Universal Variables

```

function [nsoln,v1,v2] = univar(r1,r2,tdays,iway,can)

% Gauss Uses an iteration method to solve the two position vector and time
% of flight problem
% Universal Variable method, ref Bate, Mueller & White section 5.3
% units are DU's, TU's, although input, t, is in days or minutes
% BM&W refers to Bate, Mueller & White, "Fundamental of Astrodynamics"
% NOTE:Gauss does not work with colinear position vectors, despite a time
% difference between them.

% Outputs definitions
% nsoln - number of solutions found: 0 if it fails, 1 if it found 1
% v1(i,isoln) - initial velocity vector, DU/TU, isoln = 1 or 2. This is
% the velocity required at launch, or burn. In the same frame as r1 and r2.
% v2(i,isoln) - final velocity vector, isoln = 1 or 2. This is the
% velocity of the inteceptor at the interception point

% Inputs definitions
% r1 - the position vector of the interceptor at the initial time, in DU,
% in Sun-centered Heliocentric frame or in ECEF
% r2 - the position vector at the requested point of interception, in DU,

```

```

% in Sun-centered Heliocentric frame or in ECEF frame
% tdays is elapsed time of flight, in days or minutes
% iway = 0 for "short way", else for "long way"
% can - the type of canonical units used. 0 for Interplanetary
% trajectories and 1 for Earth missions

% Constants from http://www.planck.com/heliocentric.htm
TU2day      = 58.132821;           % Days
TU2min      = 13.44686457;        % Minutes
SUs         = 29.784852;          % km/s
SUE         = 7.90536828;         % km/s

if can == 0;
    TU = TU2day;
    SU = SUs;
else TU = TU2min;
    SU = SUE;
end

xmu=1;
nsoln=0;
t = tdays/TU;
rone=mag(r1);
rtwo=mag(r2);
cosdnu = dot(r1,r2)/(rone*rtwo);
dnua = acos(dot(r1,r2)/(rone*rtwo));

if cosdnu>0.985 % The Colinear case won't converge
    nsoln=0;v1=[NaN;NaN;NaN];v2=[NaN;NaN;NaN];
    return
elseif cosdnu<-0.995
    nsoln=0;v1=[NaN;NaN;NaN];v2=[NaN;NaN;NaN];
    return
end

if iway == 0;
    DM = 1;
    dnu = dnua;
else DM = -1;
    dnu = 2*pi-dnua;
end

z = 0;
tof = t;
i = 1;
while i < 15;
    A = DM*(sqrt(rone*rtwo*(1+cos(dnu))));
    Cz = 0.5 - z/24 + (z^2)/720 - (z^3)/40320 + (z^4)/3628800;
    Sz = 1/6 - z/120 + (z^2)/5040 - (z^3)/362880 + (z^4)/39916800;
    y = rone + rtwo - A*(1-z*Sz)/sqrt(Cz);
    x = sqrt(y/Cz);
    Fz = (x^3)*Sz + A*sqrt(y) - tof*sqrt(xmu);
    if z == 0;
        Fzp = (sqrt(2)/40)*y^(3/2)+(A/8)*(sqrt(y)+A*sqrt(1/(2*y)));
    else Fzp = (x^3)*((1/(2*z)))*(Cz-
    (3/2)*(Sz/Cz))+(3/4)*((Sz^2)/Cz)+(A/8)*(3*(Sz/Cz)*sqrt(y)+A*sqrt(Cz/y));
    end

    z = z - Fz/Fzp;
    i = i+1;
end

A = DM*(sqrt(rone*rtwo*(1+cos(dnu))));
Cz = 0.5 - z/24 + (z^2)/720 - (z^3)/40320 + (z^4)/3628800;
Sz = 1/6 - z/120 + (z^2)/5040 - (z^3)/362880 + (z^4)/39916800;
y = rone + rtwo - A*(1-z*Sz)/sqrt(Cz);
x = sqrt(y/Cz);
tof = ((x^3)*Sz + A*sqrt(y))/sqrt(xmu);
if abs(t - tof) < 0.00000000000001

```

```

        nsoln = 1;
        f = 1 - (y/rone);
        g = A*sqrt(y/xmu);
        gdot = 1 - (y/rtwo);
        v1 = ((r2-f*r1)/g).';
        v2 = ((gdot*r2 - r1)/g).';
    else nsoln = 0;
        v1 = [NaN;NaN;NaN];
        v2 = [NaN;NaN;NaN];
    end

end

end

```

Vector Magnitude

```

%                               function mag
%
%  this function finds the magnitude of a vector.  the tolerance is set to
%  0.000001, thus the 1.0e-12 for the squared test of underflows.
%
%  author      : david vallado                  719-573-2600    30 may 2002
%
%  revisions
%  vallado     - fix tolerance to match coe, eq, etc          3 sep 2002
%
%  inputs      description                      range / units
%  vec         - vector
%
%  outputs     :
%  mag         - magnitude
%
%  locals      :
%  none.
%
%  coupling    :
%  none.
%
% mag = ( vec );
% ----- }

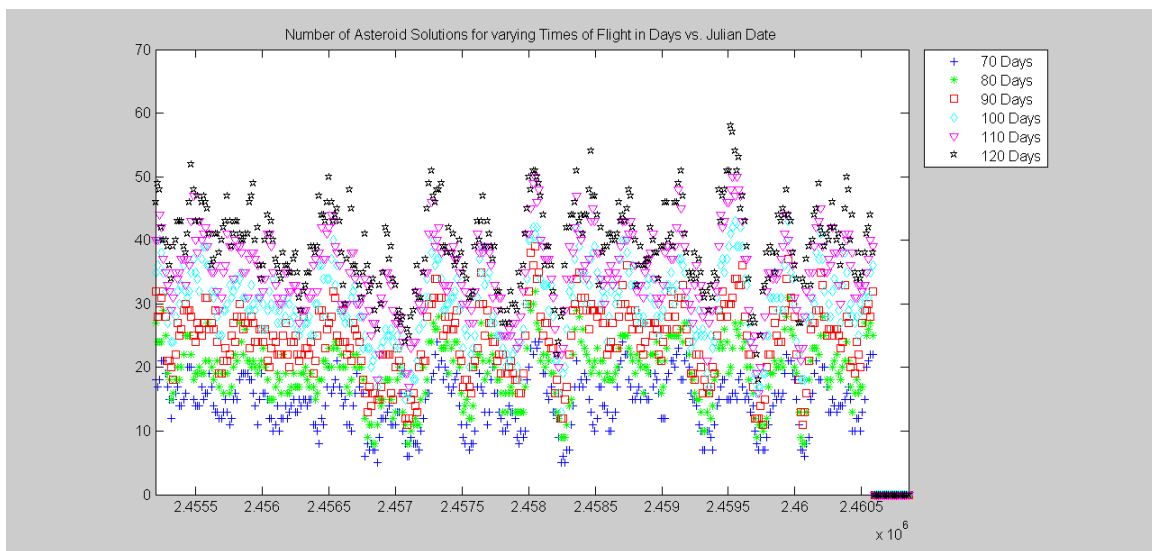
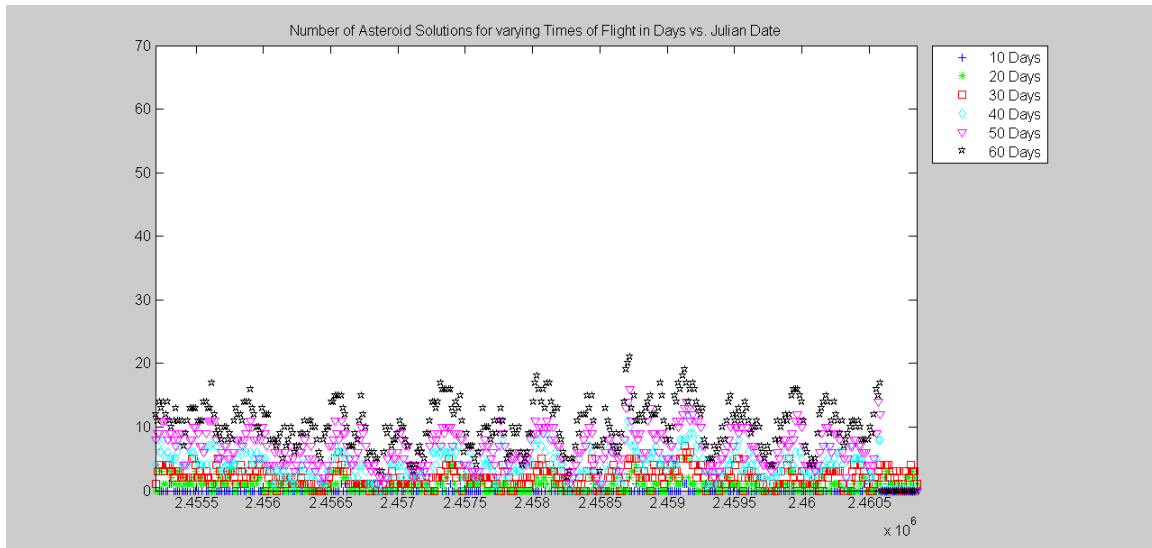
function mag = mag ( vec );

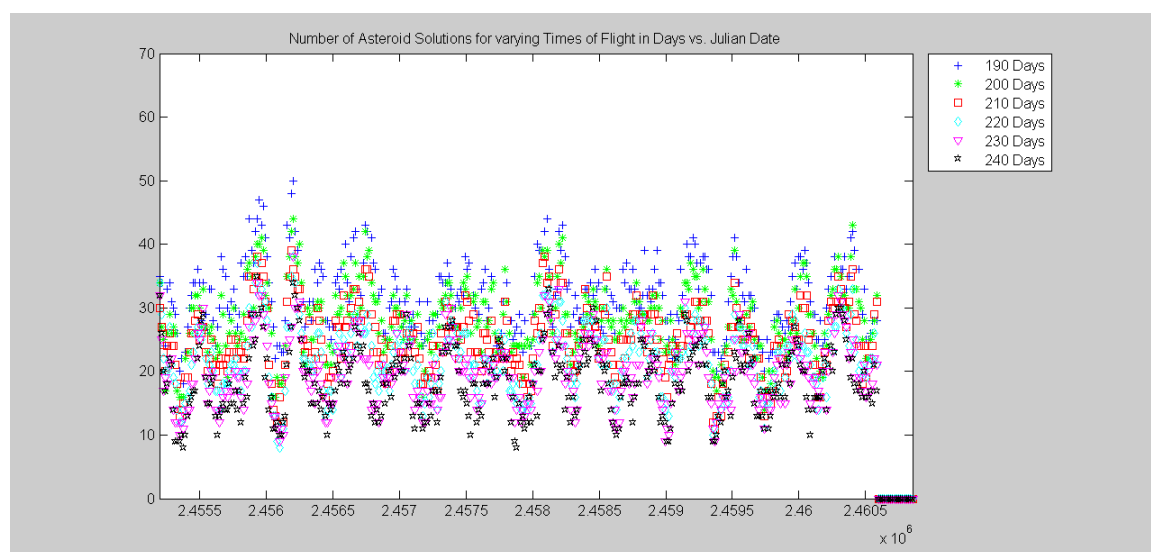
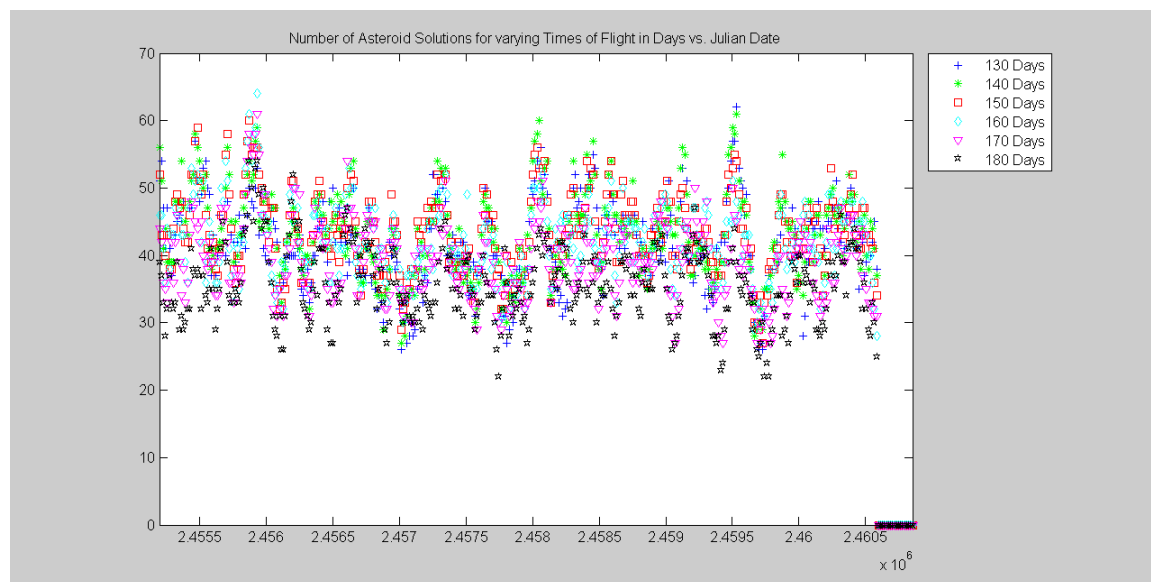
    temp= vec(1)*vec(1) + vec(2)*vec(2) + vec(3)*vec(3);

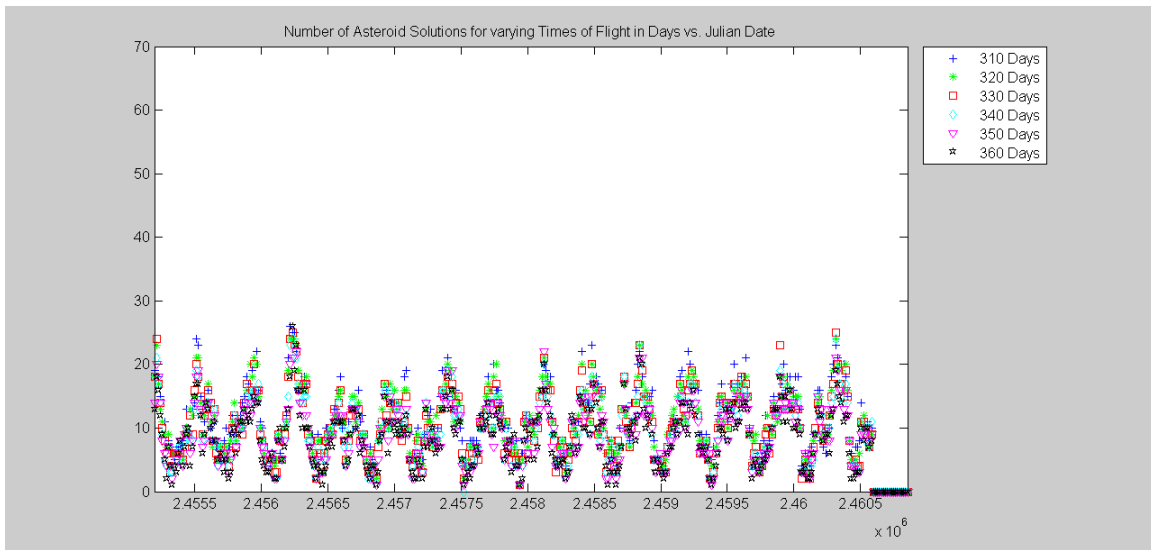
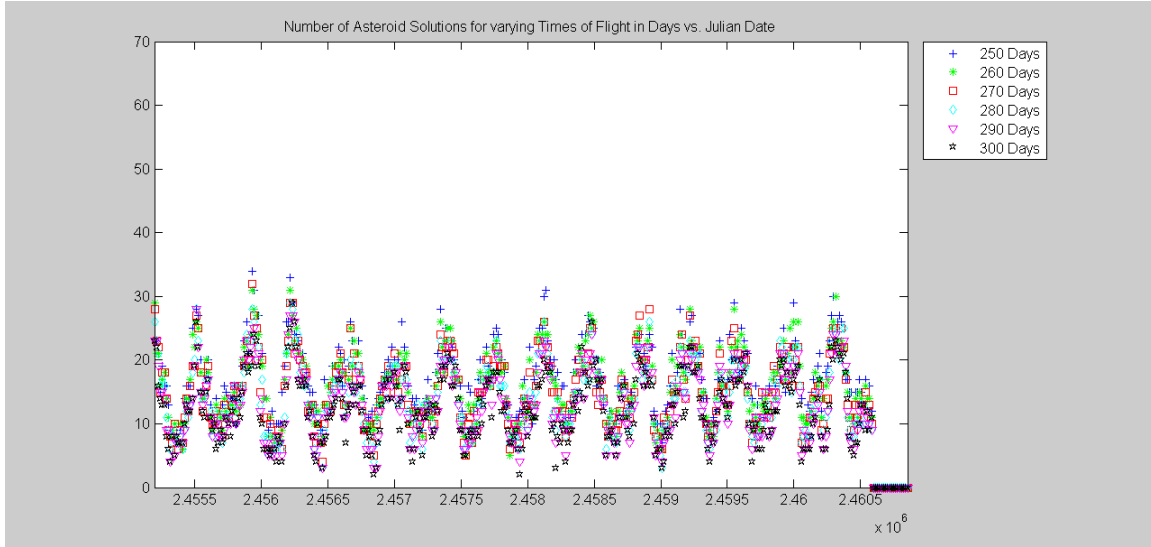
    if abs( temp ) >= 1.0e-16
        mag= sqrt( temp );
    else
        mag= 0.0;
    end

```


Appendix H: Time-of-Flight Study



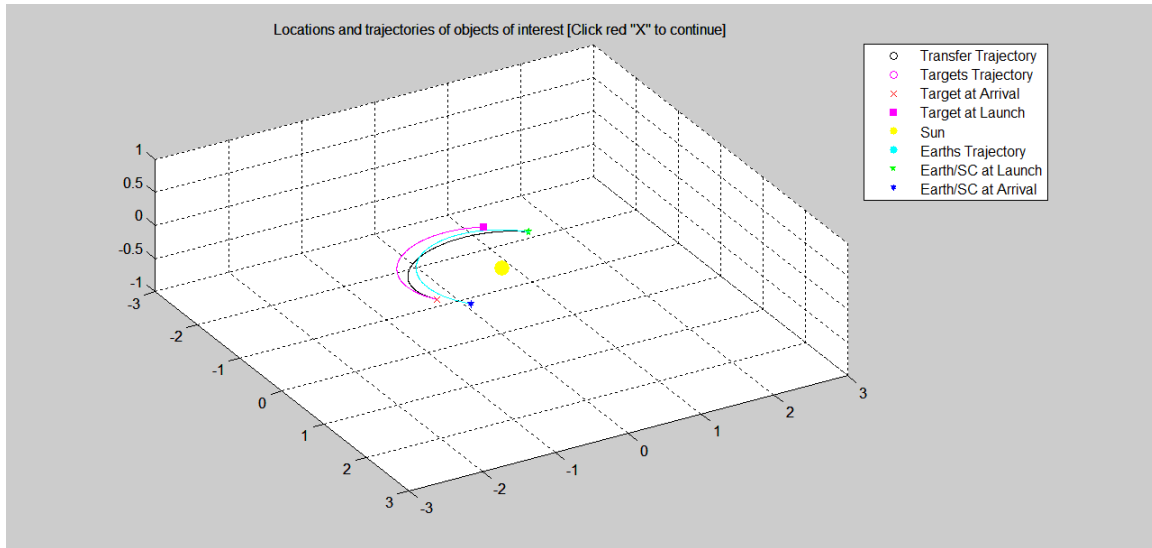




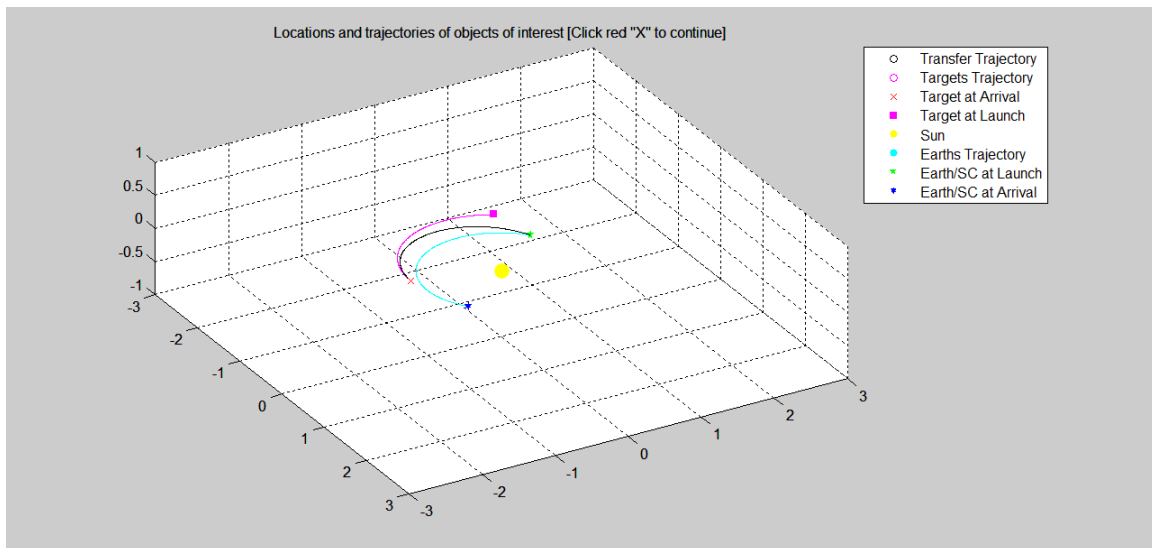
Appendix I: Objects Visited for Sample Run

The figures below show the trajectories for each object to visit using an initial launch date of January 31, 2010. There are 16 objects visited and the final arrival date back to Earth is January 18, 2026.

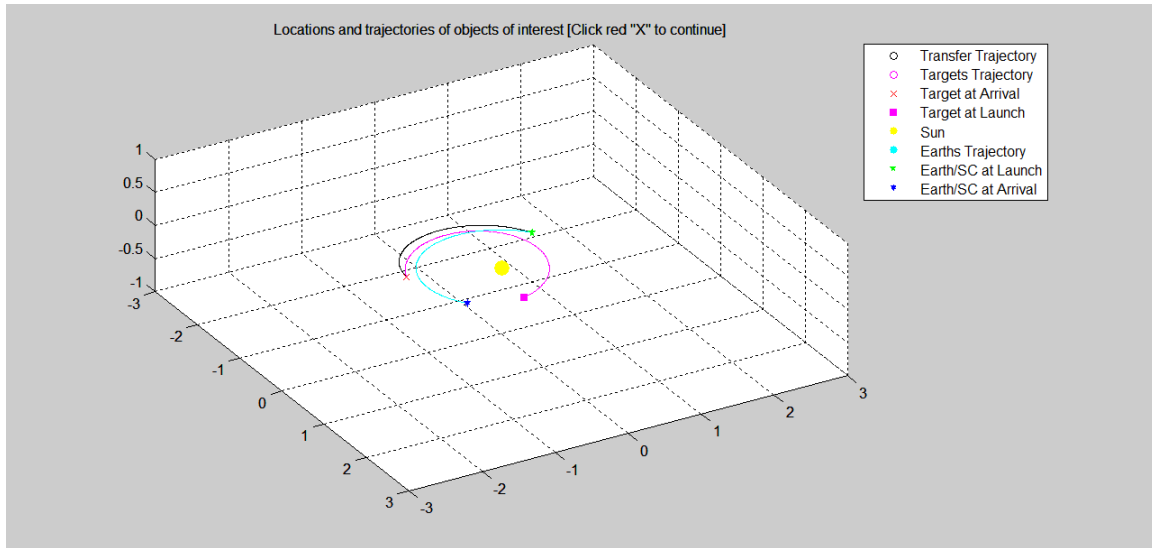
Launch Date	Object Arrival Date	Object Number	Object Name
31 Jan 10	2 Aug 10	782	164202 (2004 EW)



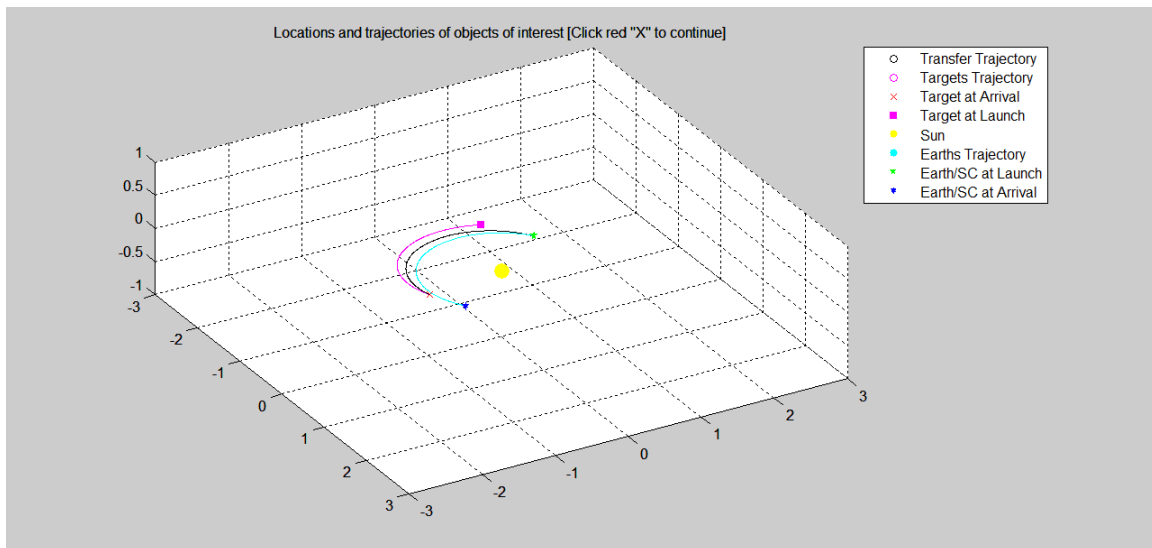
Earth Swingby Date	Object Arrival Date	Object Number	Object Name
30 Jan 11	1 Aug 11	4877	(2007 UD6)



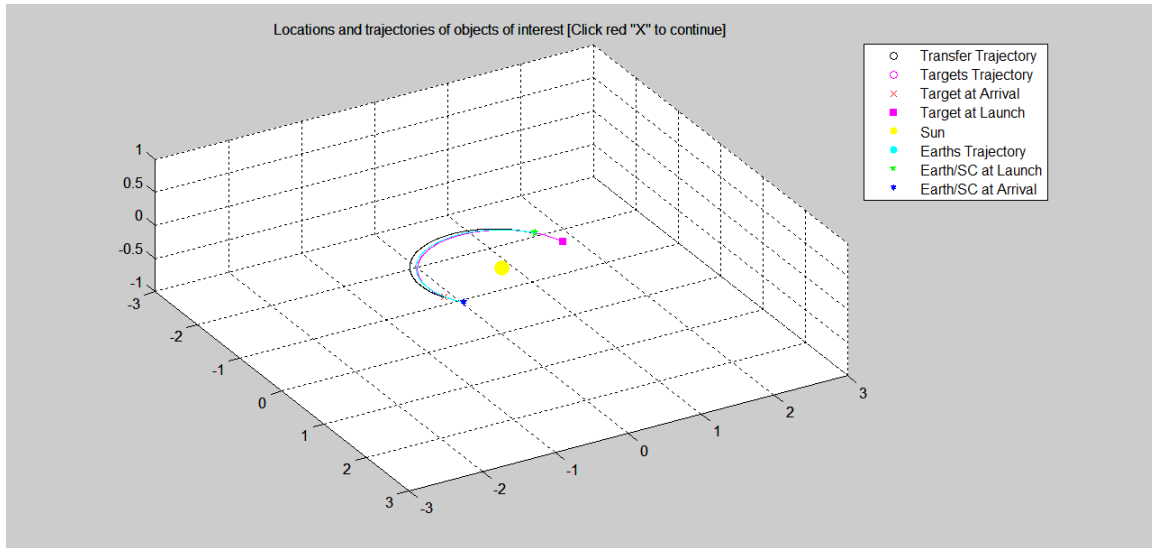
Earth Swingby Date	Object Arrival Date	Object Number	Object Name
29 Jan 12	30 Jul 12	3361	(2005 HN3)



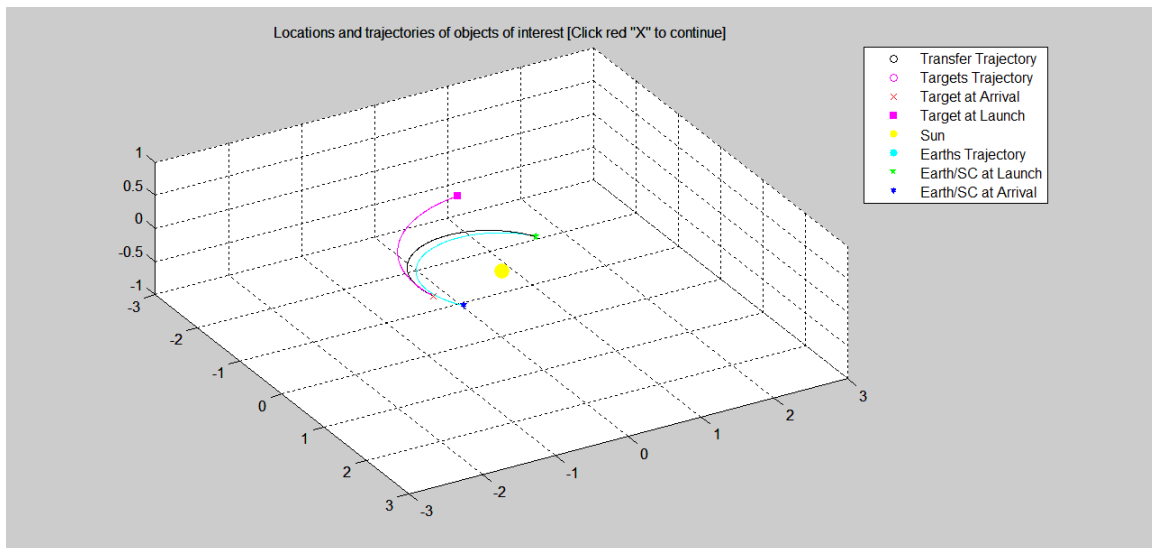
Earth Swingby Date	Object Arrival Date	Object Number	Object Name
27 Jan 13	29 Jul 13	3877	(2006 CT)



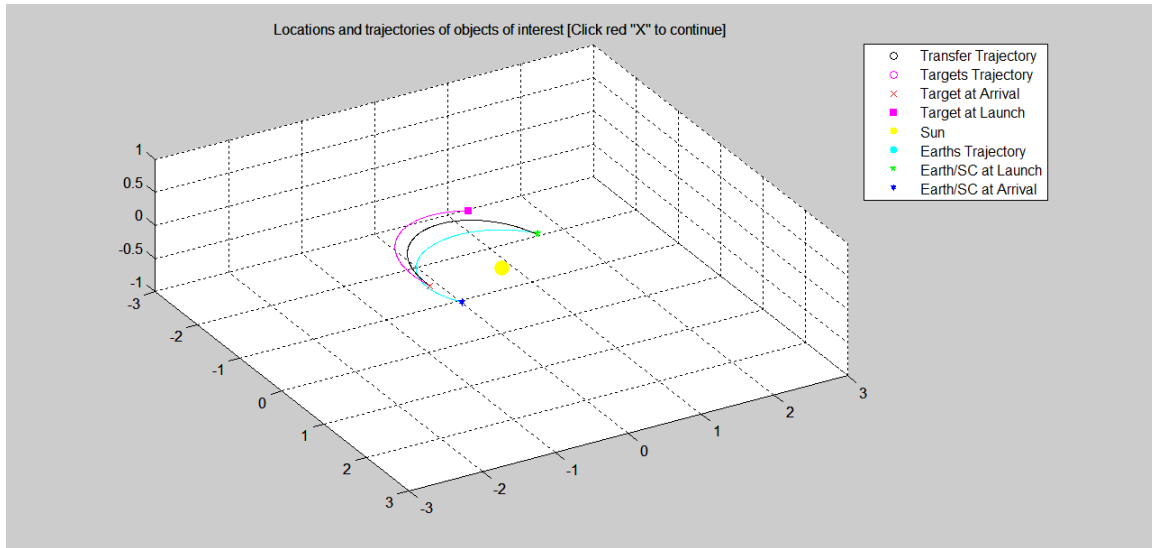
Earth Swingby Date	Object Arrival Date	Object Number	Object Name
26 Jan 14	28 Jul 14	5879	(2009 BD)



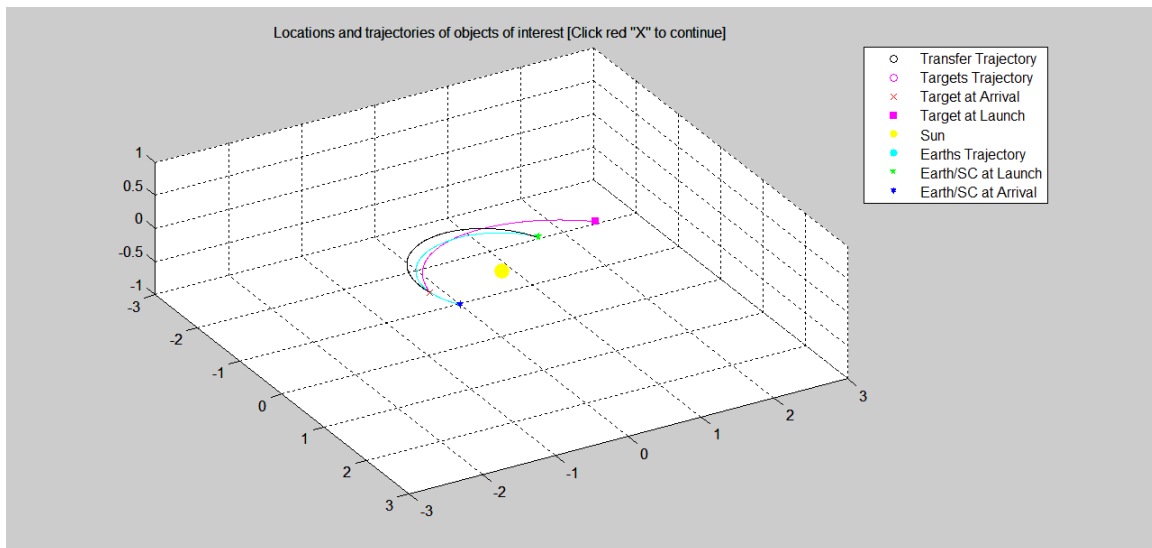
Earth Swingby Date	Object Arrival Date	Object Number	Object Name
26 Jan 15	28 Jul 15	2938	(2004 MO4)



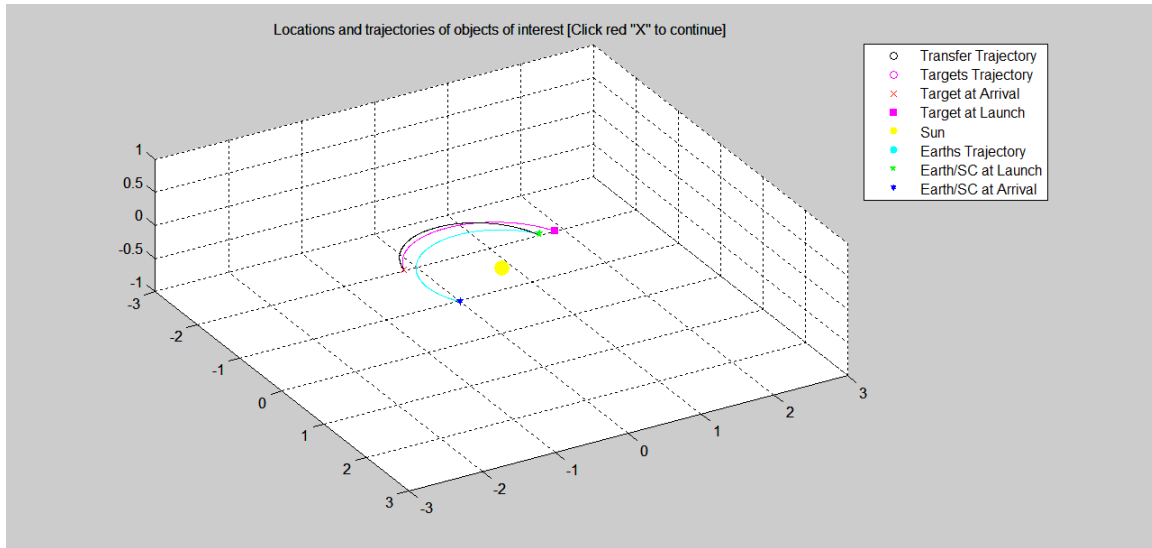
Earth Swingby Date	Object Arrival Date	Object Number	Object Name
25 Jan 16	26 Jul 16	3430	(2005 ML13)



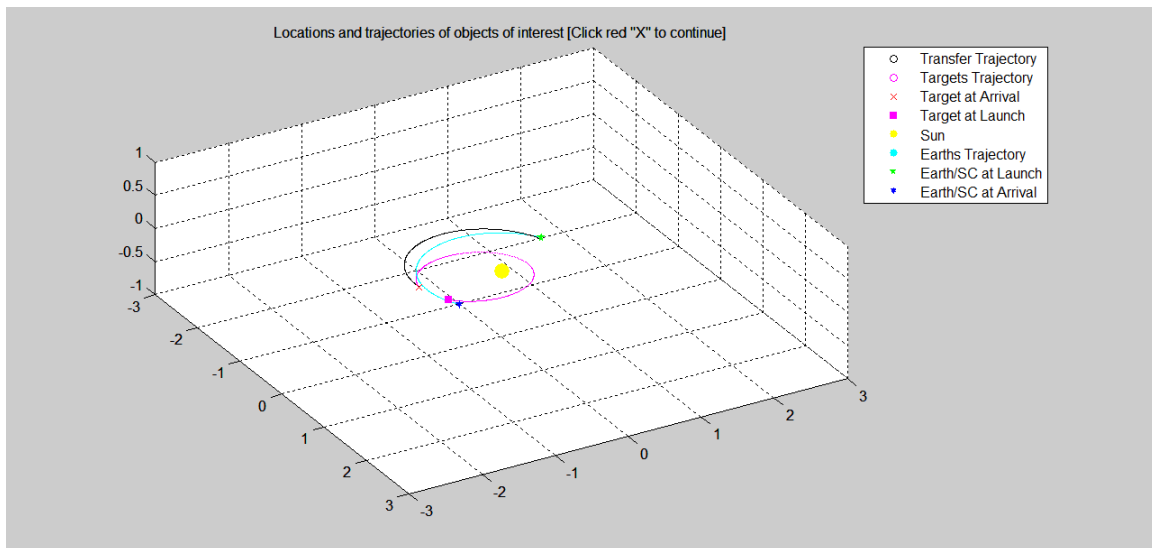
Earth Swingby Date	Object Arrival Date	Object Number	Object Name
23 Jan 17	25 Jul 17	4569	(2007 FR3)



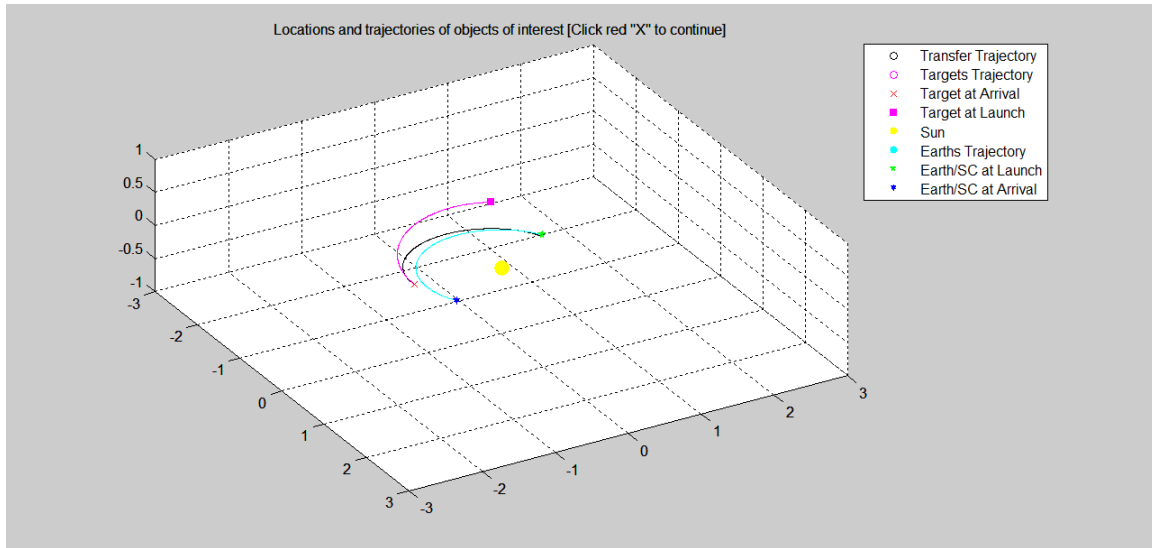
Earth Swingby Date	Object Arrival Date	Object Number	Object Name
23 Jan 18	25 Jul 18	4245	(2006 UB17)



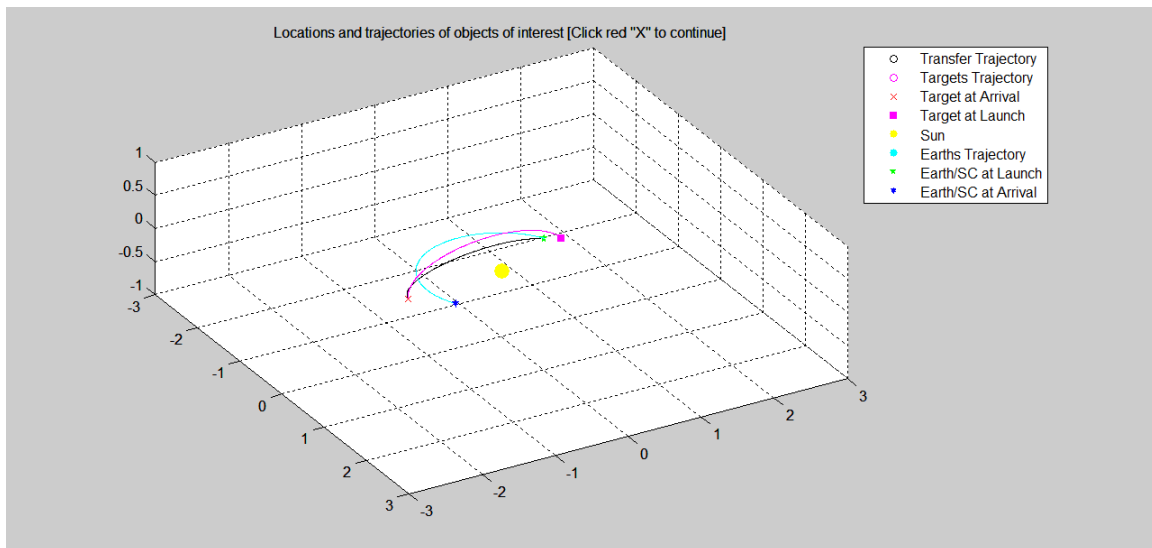
Earth Swingby Date	Object Arrival Date	Object Number	Object Name
22 Jan 19	24 Jul 19	2113	(2002 LT24)



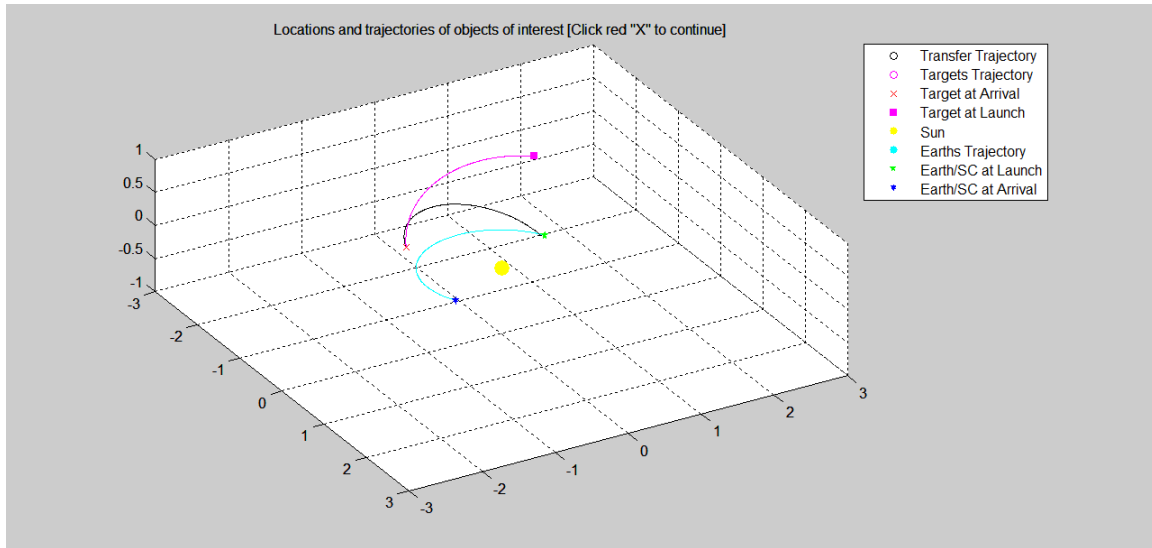
Earth Swingby Date	Object Arrival Date	Object Number	Object Name
21 Jan 20	22 Jul 20	2636	(2003 WE)



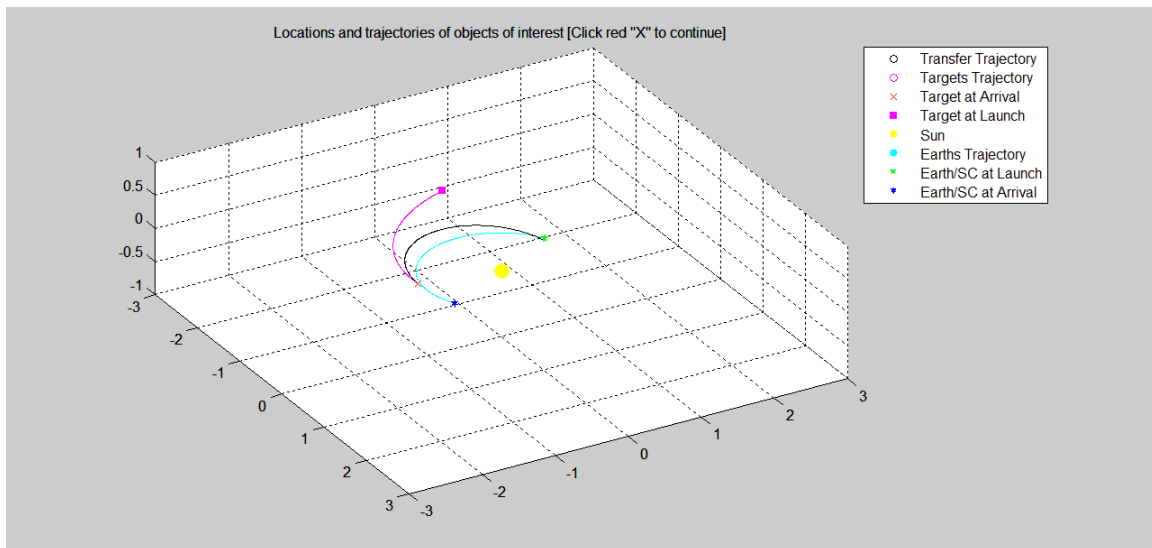
Earth Swingby Date	Object Arrival Date	Object Number	Object Name
19 Jan 21	21 Jul 21	5161	(2008 CQ116)



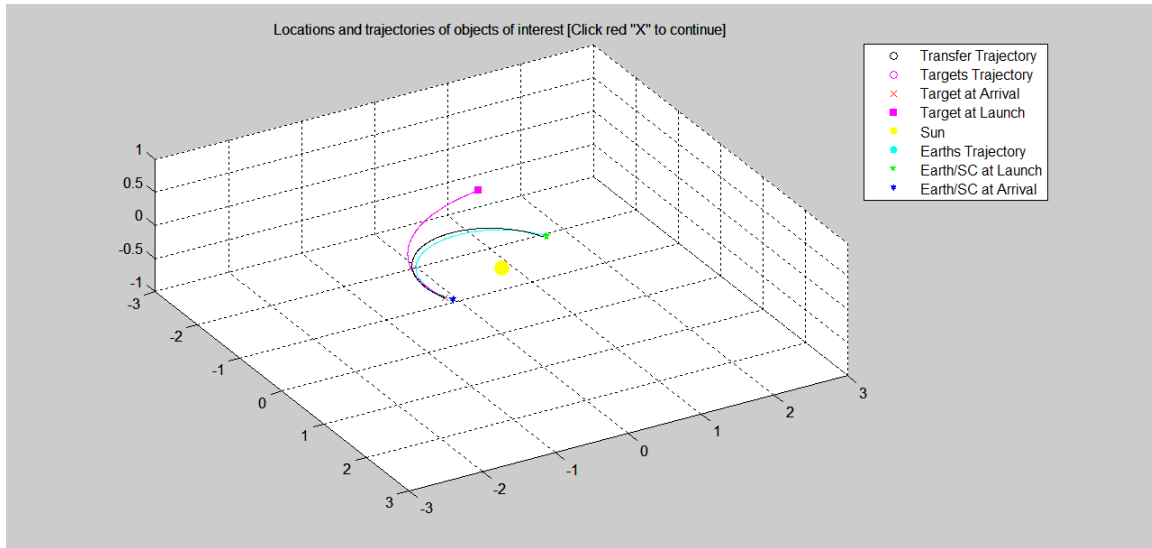
Earth Swingby Date	Object Arrival Date	Object Number	Object Name
19 Jan 22	21 Jul 22	1300	(1999 LE6)



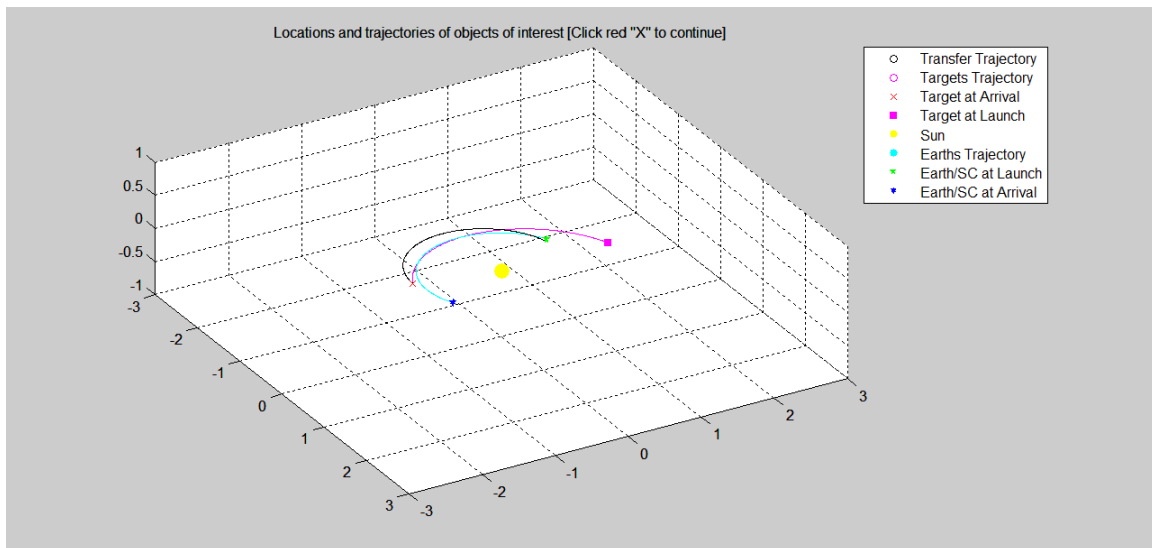
Earth Swingby Date	Object Arrival Date	Object Number	Object Name
19 Jan 23	21 Jul 23	3422	(2005 MR1)



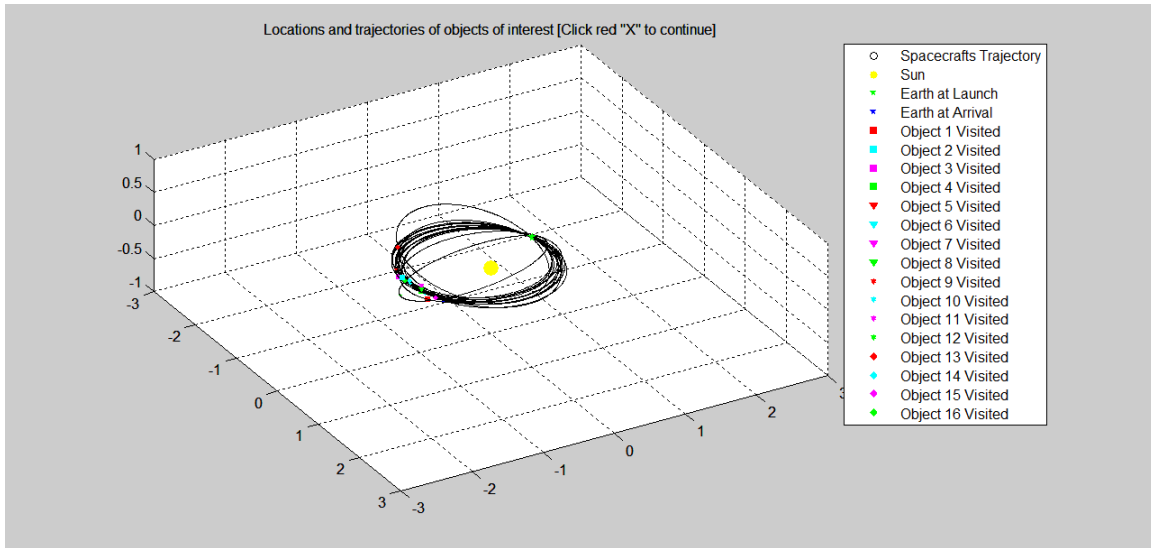
Earth Swingby Date	Object Arrival Date	Object Number	Object Name
18 Jan 24	19 Jul 24	2946	(2004 NU7)



Earth Swingby Date	Object Arrival Date	Object Number	Object Name
17 Jan 25	19 Jul 25	6055	(2009 FH)



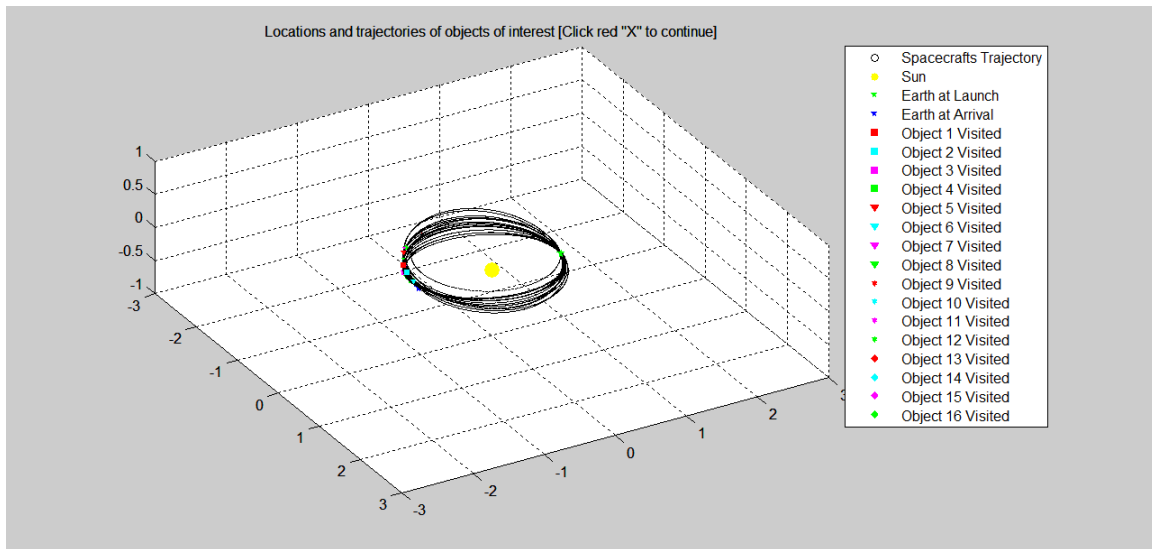
Original Launch Date	Final Earth Arrival Date
31 Jan 10	18 Jan 26



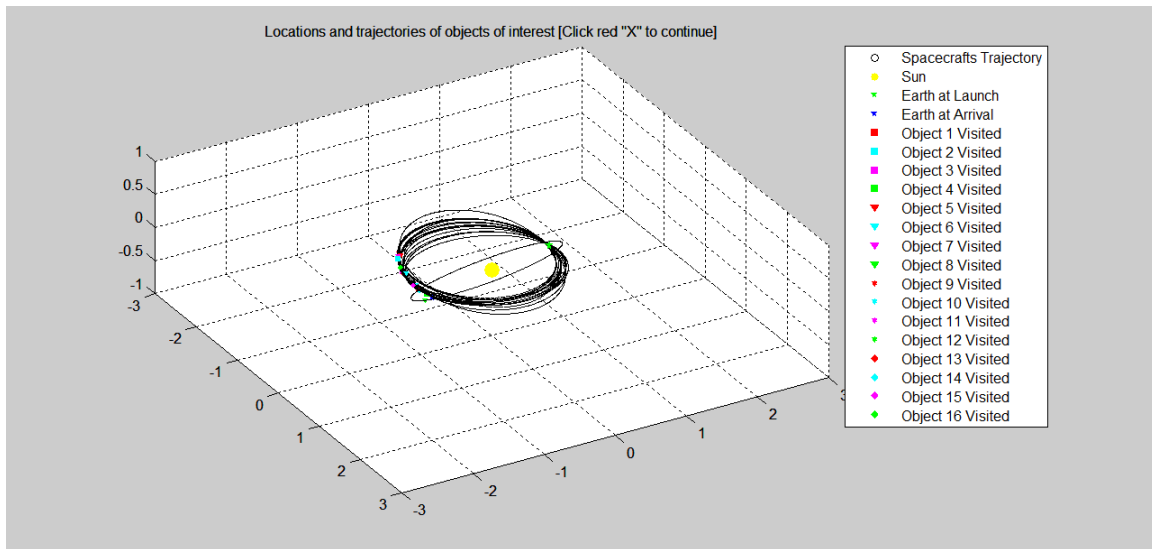
Appendix J: Launch Date Runs

The following tables are the results of searching for solutions by choosing the first day of 2010, the middle, and the end of each month. If a mid-month or end-of-month table is missing, it is because there was not a complete solution. The figure below each table is the overall trajectory for the spacecraft during its 16-year mission and the objects it visits.

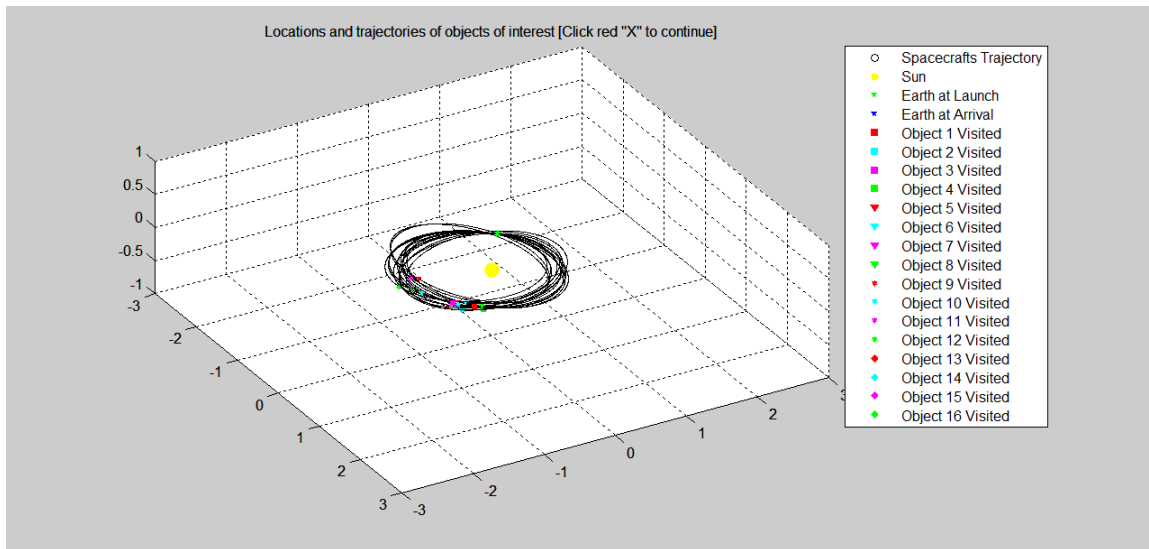
Launch Date:		1-Jan-10				
#	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	782	961.15	193.19	5.87	5.09	1.73
2	4877	68.71	11.82	7.54	3.27	1.19
3	3361	25.94	4.43	8.33	6.92	1.28
4	3877	3.51	0.60	3.82	3.03	0.62
5	5879	28.05	4.79	1.81	3.61	0.56
6	2938	49.62	8.50	3.10	6.10	0.85
7	3430	13.64	2.32	6.21	4.15	0.98
8	4569	22.53	3.84	3.51	14.60	1.63
9	4245	15.95	2.72	8.25	4.50	1.21
10	2113	37.75	6.46	4.73	8.89	1.30
11	2636	53.85	9.24	5.28	4.65	0.88
12	5161	42.35	7.25	14.87	5.51	1.93
13	1300	51.21	8.78	12.65	9.49	2.05
14	3422	33.87	5.79	5.66	8.86	1.37
15	2946	56.70	9.73	2.12	9.38	1.09
16	6055	84.91	14.64	5.37	12.50	1.77
Totals:		1549.74	294.09	99.11	110.54	20.44
*Assumed an Isp = 300 s and md = 500 kg						



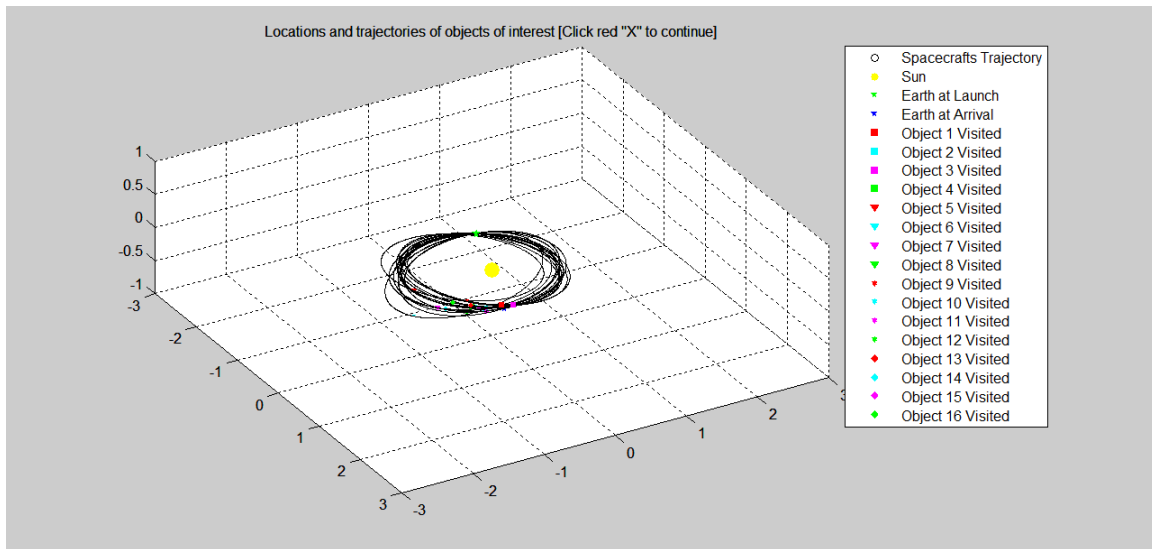
Launch Date:		15-Jan-10				
#	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	702	2757.86	776.67	3.27	11.68	2.63
2	4852	30.71	5.25	9.12	5.60	1.38
3	1004	71.38	12.28	6.81	7.09	1.29
4	5879	86.63	14.94	1.43	3.10	0.77
5	4592	46.75	8.01	10.20	9.80	1.75
6	4805	65.68	11.29	6.09	6.56	1.11
7	2786	15.93	2.72	9.50	7.08	1.51
8	4491	42.15	7.22	15.96	14.98	2.95
9	1004	103.33	17.87	5.88	5.78	1.14
10	3104	20.35	3.47	7.12	10.58	1.80
11	3301	12.30	2.09	3.67	9.41	1.43
12	4908	62.45	10.73	7.03	8.12	1.47
13	6281	52.41	8.99	10.60	4.04	1.48
14	5940	113.83	19.73	4.46	6.88	1.13
15	5556	165.32	28.90	4.65	5.13	1.16
16	6281	15.81	2.69	7.68	3.75	1.03
Totals:		3662.90	932.84	113.46	119.56	24.03
*Assumed an Isp = 300 s and md = 500 kg						



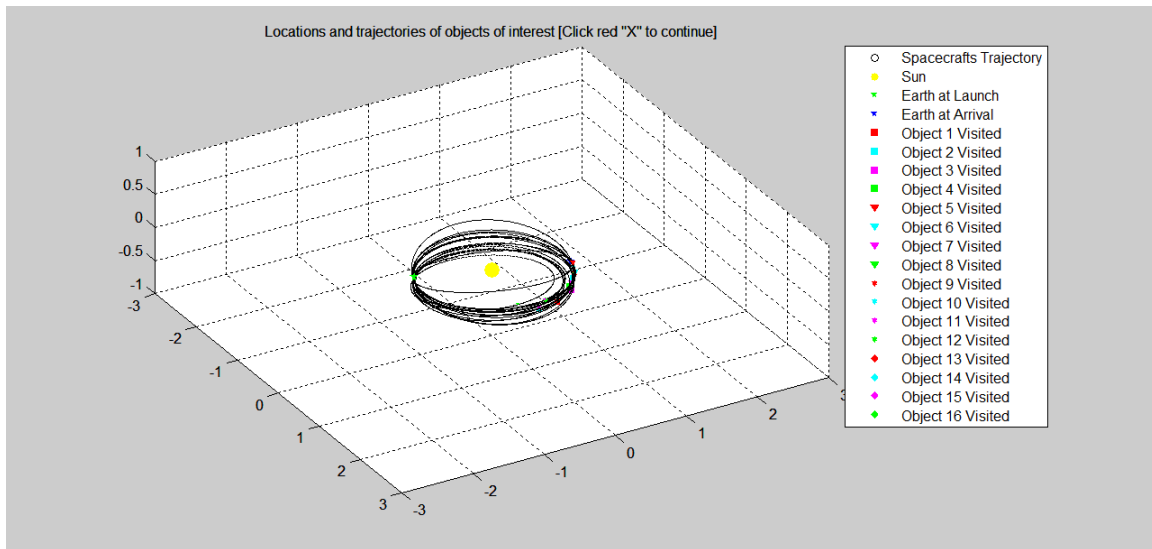
Launch Date:		28-Feb-10				
#	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	4716	2360.03	615.20	2.77	5.27	1.95
2	4122	61.12	10.50	4.99	5.32	0.95
3	4245	26.24	4.48	4.84	3.39	1.09
4	5164	64.03	11.00	4.67	13.92	1.76
5	5268	116.03	20.11	11.36	5.03	1.78
6	6391	102.04	17.65	8.37	4.52	1.29
7	5879	14.64	2.49	3.98	4.54	1.09
8	5017	25.61	4.37	4.98	11.44	1.39
9	2542	67.19	11.55	5.72	4.78	1.24
10	1717	50.82	8.71	6.21	11.76	1.55
11	5885	7.38	1.26	6.62	1.55	0.85
12	2887	65.62	11.28	8.94	7.31	1.41
13	6148	74.33	12.79	6.46	9.60	1.64
14	4245	139.76	24.33	4.47	3.02	0.90
15	2502	4.26	0.72	11.52	5.95	1.82
16	3639	48.08	8.24	11.07	6.50	1.59
Totals:		3227.18	764.68	106.97	103.89	22.29
*Assumed an Isp = 300 s and md = 500 kg						



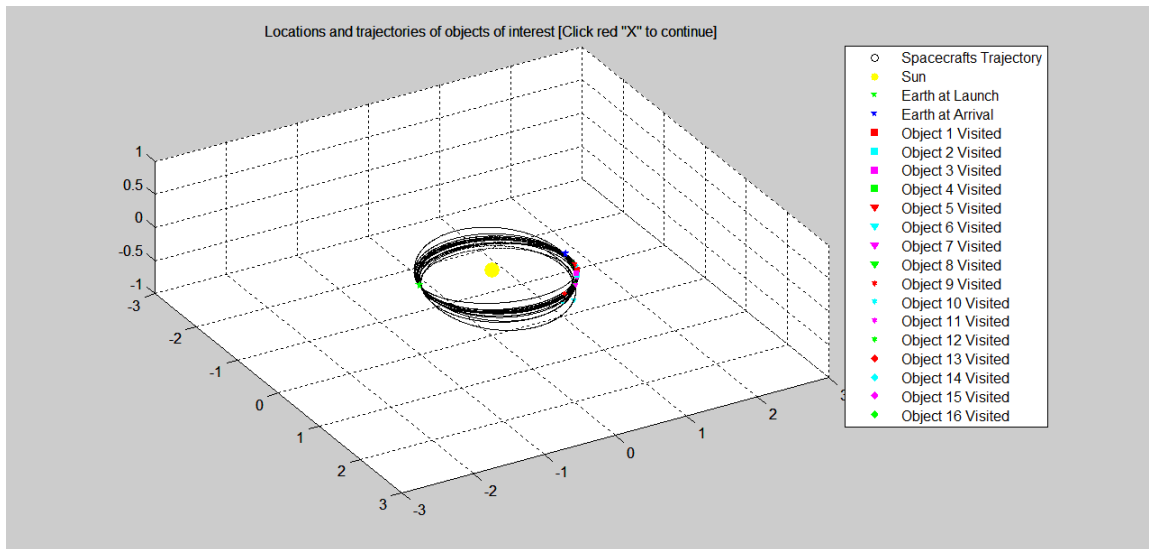
Launch Date:		15-Mar-10				
#	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	4056	3926.07	1399.02	4.89	5.72	2.63
2	1741	66.34	11.40	3.68	8.33	1.29
3	4056	8.16	1.39	3.15	6.36	1.16
4	1840	69.69	11.99	4.33	6.50	1.10
5	1500	65.78	11.31	11.13	8.97	2.05
6	4707	161.87	28.28	4.92	10.02	1.70
7	3510	140.15	24.40	8.37	3.92	1.11
8	2531	3.49	0.59	6.62	10.76	1.82
9	3672	20.22	3.45	7.77	14.14	2.05
10	1059	51.78	8.88	13.87	9.23	1.98
11	4707	110.97	19.22	4.12	8.78	1.28
12	6320	160.21	27.98	7.57	6.40	1.24
13	1082	44.68	7.65	5.65	12.86	1.79
14	3510	63.02	10.83	6.91	3.32	1.14
15	4163	71.78	12.35	4.63	8.38	1.44
16	1309	129.44	22.49	6.55	7.87	1.62
Totals:		5093.67	1601.22	104.17	131.57	25.40
*Assumed an Isp = 300 s and md = 500 kg						



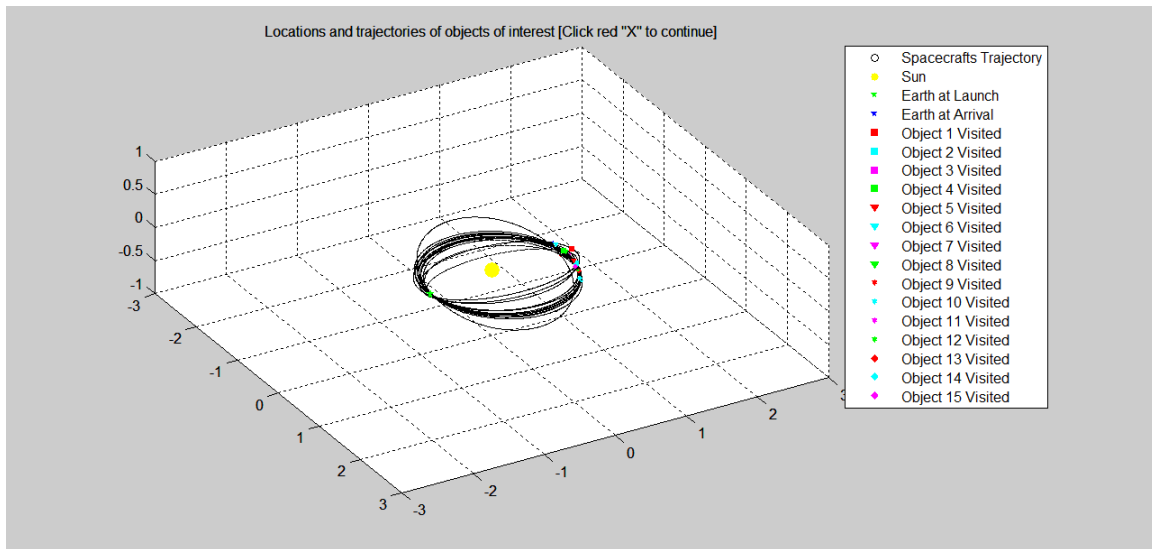
Launch Date:		15-Jun-10				
#	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	4529	4252.82	1622.09	10.09	3.69	3.19
2	1113	230.71	40.79	5.18	6.73	1.49
3	2671	178.68	31.31	7.01	4.19	1.25
4	4918	88.21	15.22	7.48	7.20	1.50
5	3174	32.15	5.49	8.48	7.86	1.71
6	3691	92.01	15.88	3.21	10.46	1.37
7	689	32.35	5.53	6.79	2.70	0.93
8	4017	56.08	9.62	3.79	5.79	1.04
9	726	49.88	8.55	3.47	5.88	1.06
10	5769	7.39	1.26	7.35	5.92	1.20
11	1738	19.90	3.39	11.29	3.92	1.42
12	323	112.59	19.51	14.95	5.98	2.01
13	5779	14.72	2.51	3.93	2.47	0.92
14	3044	102.39	17.71	11.57	6.91	1.59
15	4216	119.82	20.78	12.07	4.13	1.65
16	689	66.27	11.39	11.64	4.03	1.39
Totals:		5455.96	1831.03	128.33	87.87	23.74
*Assumed an Isp = 300 s and md = 500 kg						



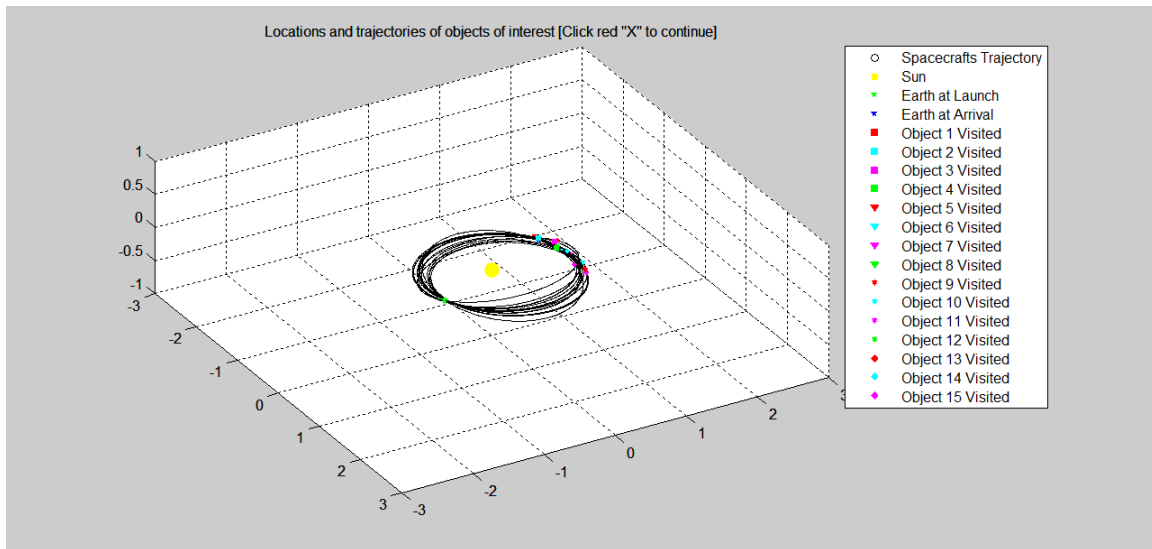
Launch Date:		30-Jun-10				
#	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	5706	2731.74	765.39	4.99	6.86	2.18
2	6435	60.87	10.45	6.98	5.99	1.31
3	1559	43.71	7.48	7.44	10.71	1.57
4	3695	58.08	9.97	3.31	8.16	1.19
5	5879	40.76	6.98	3.56	2.52	0.70
6	3830	6.16	1.05	10.03	5.49	1.57
7	3121	64.79	11.13	7.93	5.77	1.44
8	4394	40.46	6.92	5.39	4.16	0.83
9	4017	28.18	4.81	3.71	6.21	1.22
10	4265	34.05	5.82	10.90	9.48	1.88
11	1574	125.26	21.75	5.14	4.23	0.89
12	1227	39.33	6.73	5.45	4.88	1.22
13	3828	1.30	0.22	10.81	4.90	1.55
14	6435	47.66	8.17	5.53	6.78	1.08
15	4933	51.77	8.88	5.84	4.44	1.15
16	1574	34.06	5.82	6.67	3.41	1.14
Totals:		3408.20	881.58	103.66	93.98	20.91
*Assumed an Isp = 300 s and md = 500 kg						



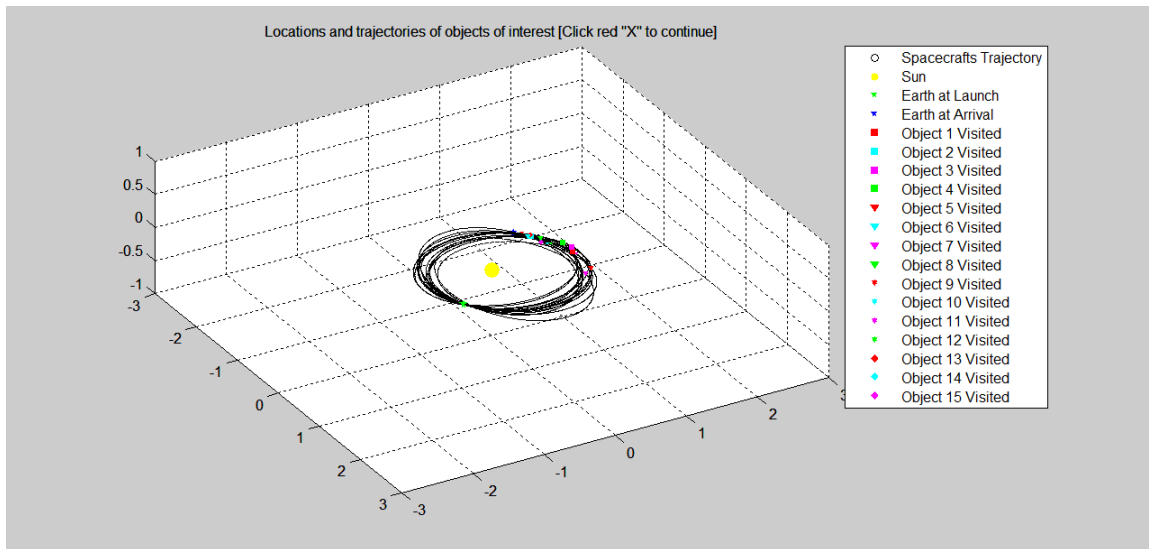
Launch Date:		15-Jul-10				
#	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	2222	1039.82	211.98	8.24	7.80	1.92
2	5747	57.41	9.85	5.91	10.79	1.42
3	5825	25.03	4.27	4.66	4.91	1.22
4	5879	10.47	1.78	3.66	1.73	0.73
5	3115	7.47	1.27	5.80	1.45	0.94
6	3141	29.32	5.01	4.72	9.17	1.28
7	5016	53.53	9.18	3.48	13.46	1.59
8	4394	7.41	1.26	3.55	7.08	1.13
9	4551	39.98	6.84	12.12	12.02	2.26
10	1470	22.29	3.80	9.33	7.48	1.47
11	2486	119.11	20.66	14.20	2.66	1.67
12	5781	9.06	1.54	6.66	11.01	1.67
13	1674	8.39	1.43	6.78	7.68	1.60
14	6030	49.00	8.40	9.93	7.46	1.60
15	4388	69.07	11.88	5.54	8.30	1.41
Totals:		1547.37	299.15	104.58	113.01	21.91
*Assumed an Isp = 300 s and md = 500 kg						



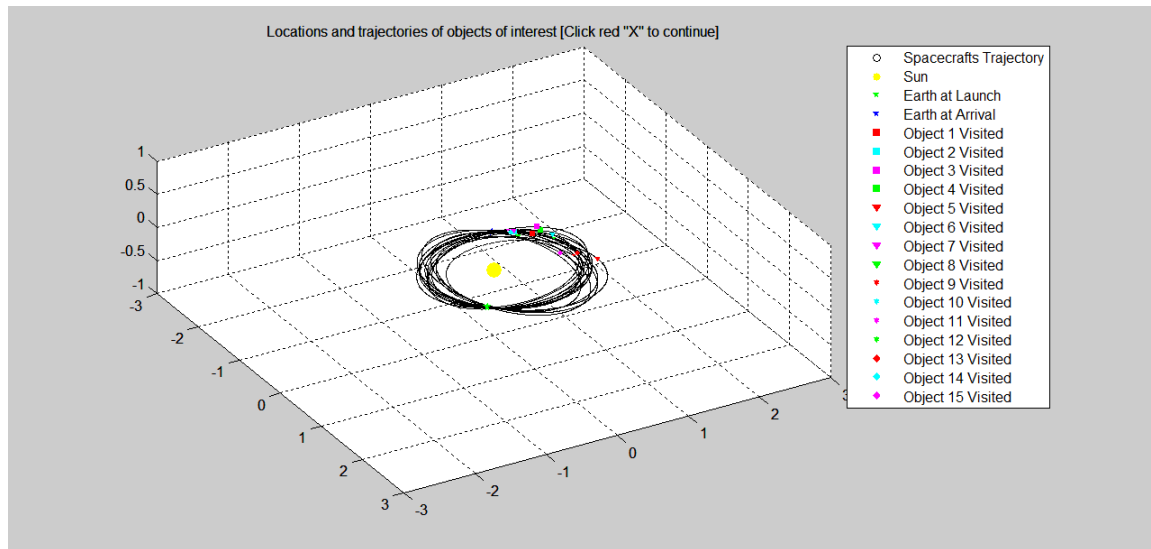
Launch Date:		30-Jul-10				
#	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	2222	1039.82	211.98	8.24	7.80	1.92
2	5747	57.41	9.85	5.91	10.79	1.42
3	5825	25.03	4.27	4.66	4.91	1.22
4	5879	10.47	1.78	3.66	1.73	0.73
5	3115	7.47	1.27	5.80	1.45	0.94
6	3141	29.32	5.01	4.72	9.17	1.28
7	5016	53.53	9.18	3.48	13.46	1.59
8	4394	7.41	1.26	3.55	7.08	1.13
9	4551	39.98	6.84	12.12	12.02	2.26
10	1470	22.29	3.80	9.33	7.48	1.47
11	2486	119.11	20.66	14.20	2.66	1.67
12	5781	9.06	1.54	6.66	11.01	1.67
13	1674	8.39	1.43	6.78	7.68	1.60
14	6030	49.00	8.40	9.93	7.46	1.60
15	4388	69.07	11.88	5.54	8.30	1.41
Totals:		1547.37	299.15	104.58	113.01	21.91
*Assumed an Isp = 300 s and md = 500 kg						



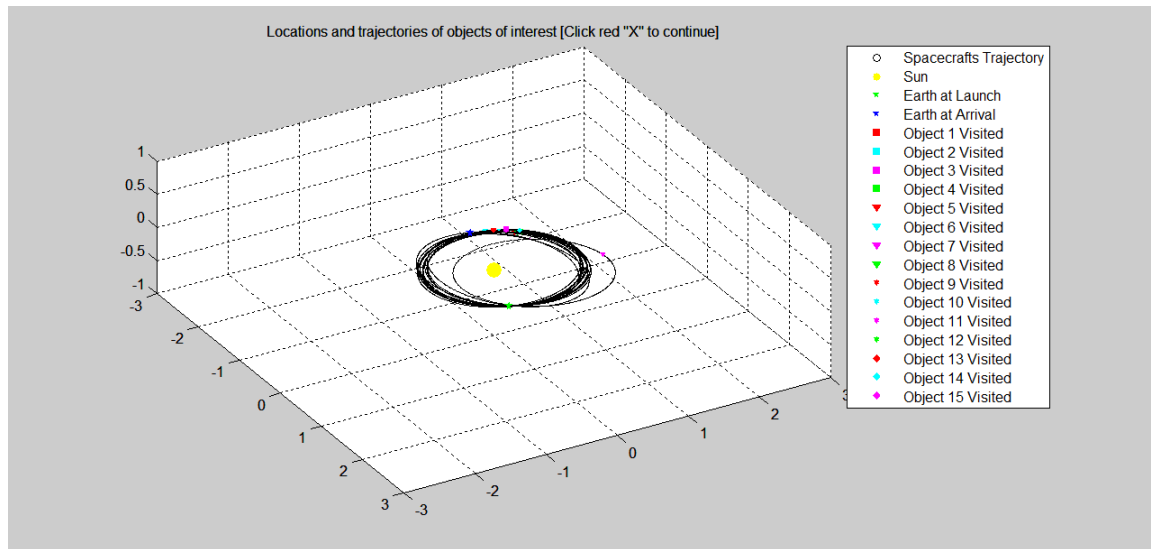
Launch Date:		15-Aug-10				
#	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	3867	2437.28	644.87	7.94	4.85	2.09
2	1623	78.89	13.59	2.87	5.27	0.81
3	3139	17.68	3.01	8.00	9.72	1.86
4	1036	77.96	13.43	7.17	7.67	1.51
5	4543	70.76	12.17	11.36	11.45	2.30
6	1971	110.55	19.15	3.55	7.58	1.06
7	3715	159.54	27.86	11.66	2.45	1.26
8	739	67.02	11.52	3.77	7.77	1.22
9	1253	80.53	13.87	2.55	2.25	0.70
10	405	39.12	6.69	6.21	8.08	1.48
11	2704	31.79	5.43	8.75	3.31	1.08
12	1397	74.44	12.81	5.49	16.01	1.84
13	4507	84.17	14.51	3.78	6.37	1.23
14	5853	64.02	11.00	7.89	6.53	1.53
15	2367	91.90	15.87	7.35	4.28	1.19
Totals:		3485.64	825.79	98.35	103.58	21.15
*Assumed an Isp = 300 s and md = 500 kg						



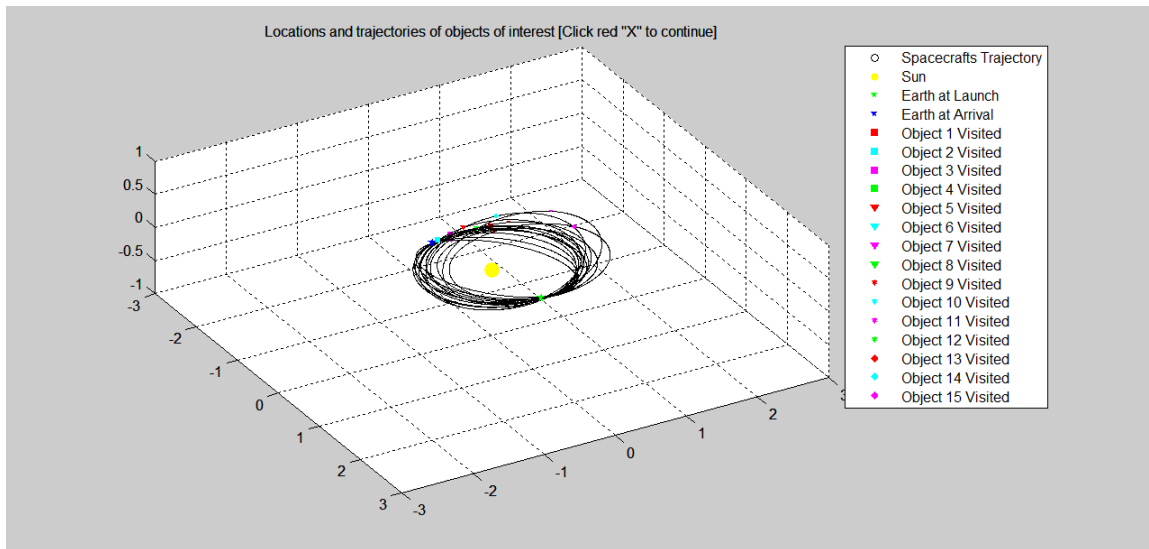
Launch Date:		31-Aug-10				
#	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	3668	4016.11	1458.04	5.02	1.94	2.63
2	1623	27.70	4.73	3.13	4.30	0.81
3	2671	25.59	4.37	8.27	12.59	1.86
4	2810	25.26	4.31	7.19	3.74	1.23
5	170	35.32	6.04	14.11	8.03	2.05
6	3210	189.30	33.23	8.60	11.16	1.96
7	2354	121.82	21.14	4.59	6.98	1.27
8	6249	66.66	11.46	8.35	8.37	1.67
9	4599	17.33	2.95	11.34	8.06	1.63
10	4384	63.22	10.86	4.48	3.20	1.02
11	1638	83.04	14.31	5.08	6.74	1.04
12	4408	22.54	3.84	7.62	8.62	1.46
13	3882	91.20	15.74	11.37	4.68	1.42
14	2730	29.59	5.05	4.97	7.23	1.04
15	1407	87.01	15.01	10.43	9.55	1.81
Totals:		4901.66	1611.09	114.55	105.19	22.90
*Assumed an Isp = 300 s and md = 500 kg						



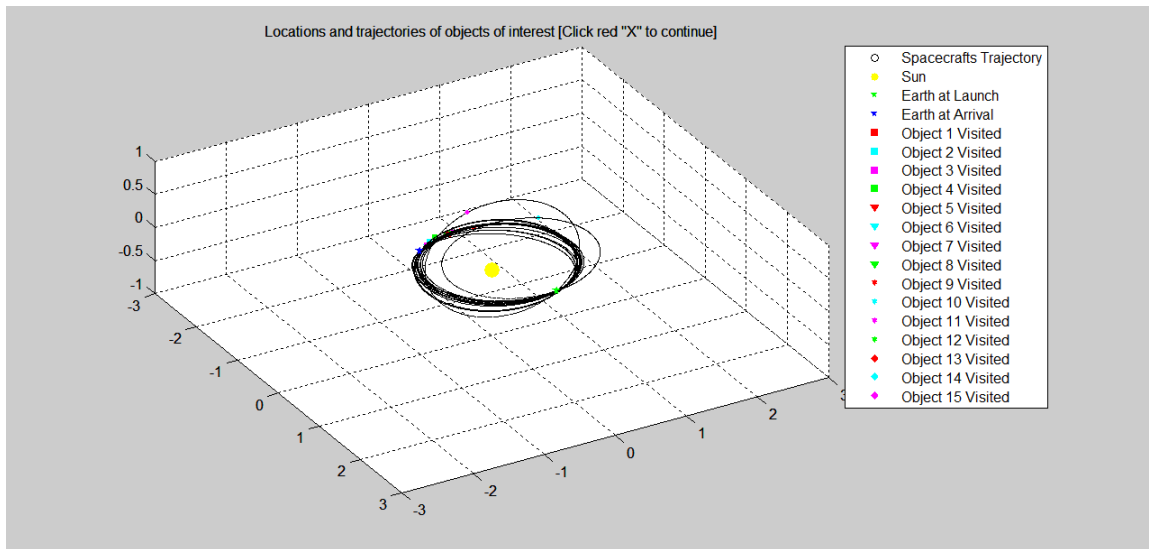
Launch Date:		15-Sep-10				
#	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	77	5234.65	2462.78	3.36	9.71	3.33
2	6061	3.04	0.52	2.69	7.20	1.14
3	5889	28.00	4.78	4.43	3.69	1.08
4	4507	64.08	11.01	5.97	9.48	1.46
5	6061	2.26	0.38	5.10	7.25	1.21
6	3258	41.51	7.11	1.87	7.28	1.03
7	5031	7.83	1.33	16.06	5.19	1.86
8	1993	250.21	44.38	5.47	9.30	1.44
9	1253	237.73	42.08	4.24	4.84	1.03
10	3882	73.34	12.62	3.67	4.94	1.06
11	3995	22.88	3.90	8.19	4.68	1.35
12	4408	16.36	2.79	7.39	10.41	1.79
13	703	10.44	1.78	4.09	10.82	1.42
14	2019	47.23	8.09	6.29	7.49	1.24
15	2367	36.90	6.31	4.76	4.89	1.11
Totals:		6076.45	2609.87	83.57	107.17	21.54
*Assumed an Isp = 300 s and md = 500 kg						



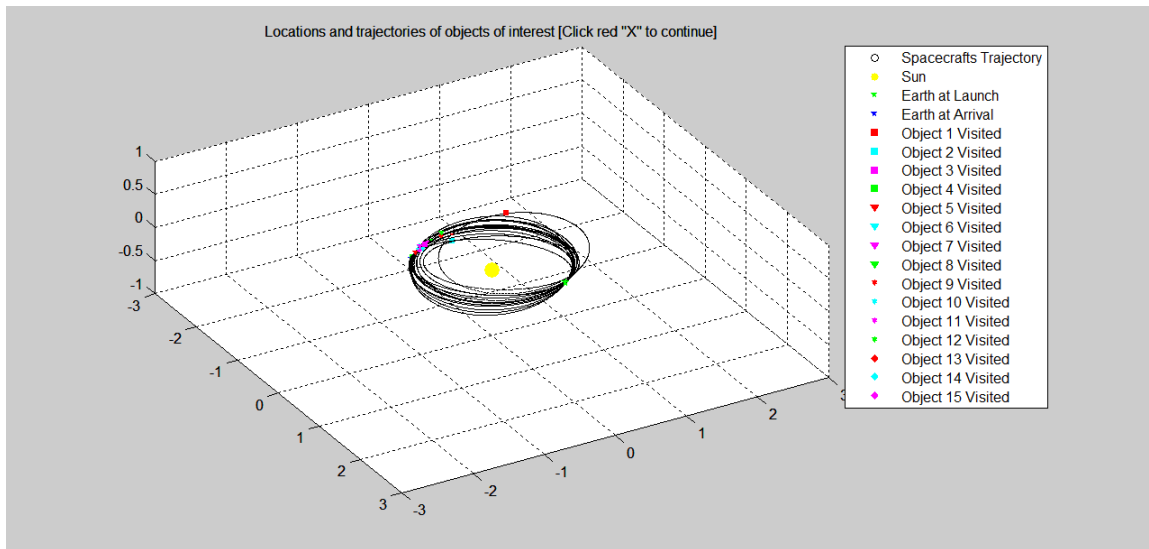
Launch Date:		15-Oct-10				
#	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	5706	6766.58	4487.02	7.52	5.46	4.16
2	1940	86.55	14.93	2.36	6.29	0.94
3	6099	46.09	7.89	4.01	3.39	0.68
4	5746	40.83	6.99	6.20	8.51	1.54
5	5302	48.16	8.25	6.57	3.22	0.88
6	1669	26.21	4.48	4.05	5.01	1.05
7	1327	26.59	4.54	8.32	2.23	0.92
8	1993	30.29	5.18	6.60	6.09	1.37
9	5314	77.06	13.27	10.39	6.78	1.77
10	3295	23.53	4.01	6.07	5.28	1.07
11	463	82.22	14.17	15.68	5.28	2.07
12	3896	129.90	22.57	12.35	4.95	1.83
13	2721	26.84	4.58	8.72	5.80	1.47
14	5639	76.74	13.21	11.05	3.19	1.46
15	3272	53.00	9.09	17.55	5.18	2.08
Totals:		7540.57	4620.18	127.45	76.67	23.28
*Assumed an Isp = 300 s and md = 500 kg						



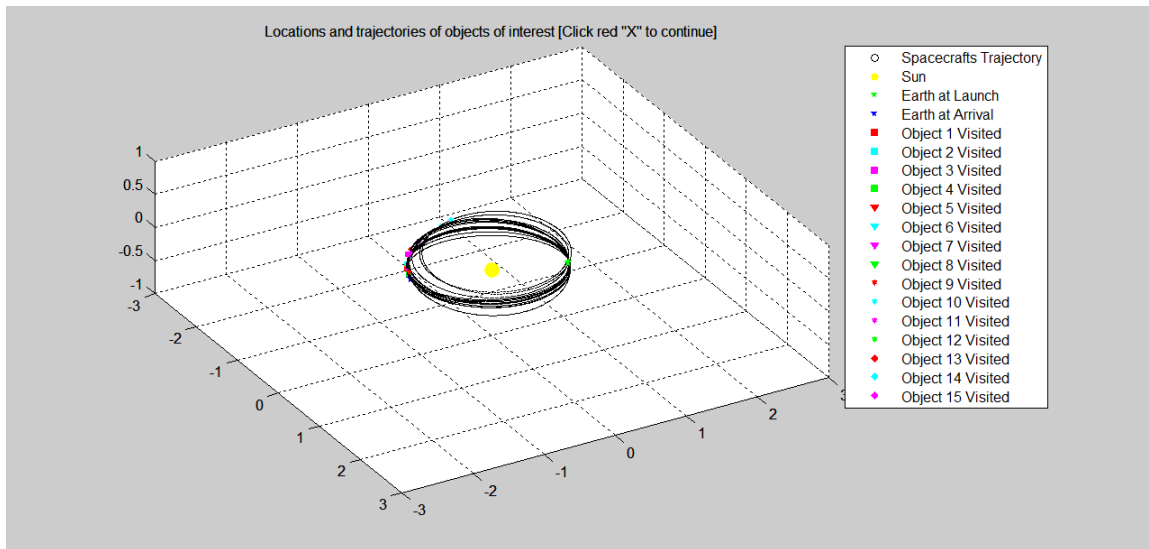
Launch Date:		31-Oct-10				
#	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	3930	7033.83	4961.24	5.55	5.32	3.98
2	6478	85.46	14.74	5.06	3.49	0.97
3	405	45.52	7.80	2.66	3.26	0.53
4	5233	3.49	0.59	5.27	7.84	1.11
5	5269	27.42	4.68	5.16	11.29	1.43
6	5379	17.25	2.94	3.00	2.52	0.55
7	4017	60.14	10.33	5.78	2.66	1.01
8	5922	70.19	12.07	5.69	3.40	0.89
9	4017	5.09	0.87	7.19	3.44	1.00
10	6079	49.66	8.51	6.83	6.22	1.49
11	2787	33.52	5.73	5.12	5.41	1.07
12	3308	52.10	8.93	4.86	8.07	1.34
13	6074	10.56	1.80	7.85	8.38	1.46
14	1033	21.90	3.74	14.99	3.81	1.91
15	3584	187.29	32.86	15.14	5.26	1.80
Totals:		7703.42	5076.83	100.14	80.38	20.54
*Assumed an Isp = 300 s and md = 500 kg						



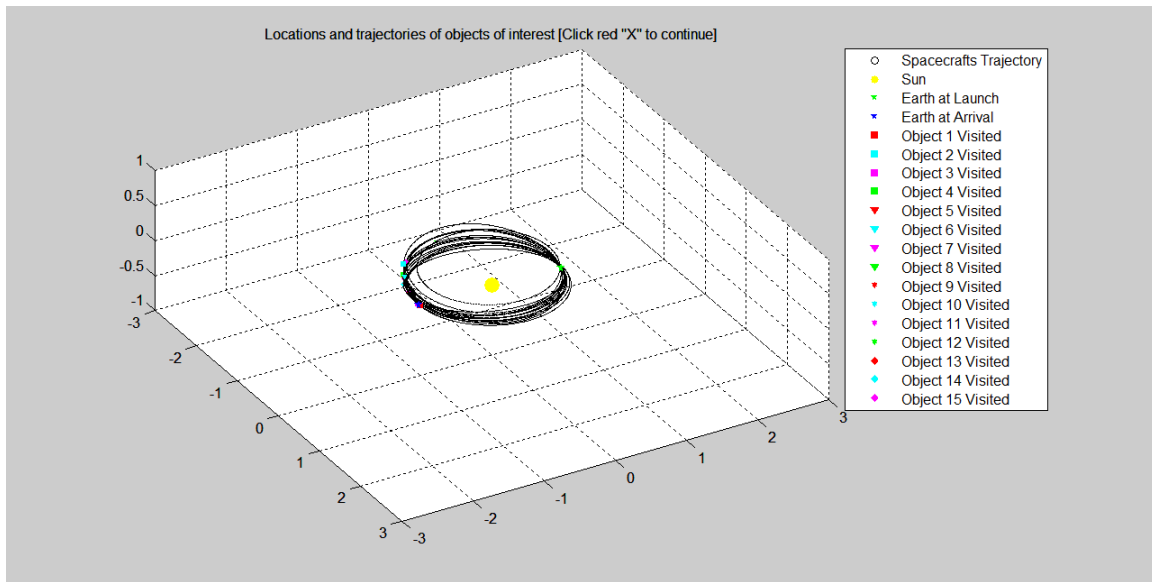
Launch Date:		15-Nov-10				
#	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	4566	6916.74	4748.16	15.01	4.75	4.86
2	1409	215.30	37.96	9.84	7.79	1.92
3	4017	91.86	15.86	4.29	1.61	0.70
4	2449	113.64	19.69	1.72	4.65	0.98
5	2441	7.63	1.30	2.74	11.35	1.23
6	5189	15.18	2.59	4.80	4.64	0.94
7	3353	18.56	3.17	4.94	13.31	1.58
8	471	7.29	1.24	6.82	3.13	0.94
9	2784	39.93	6.83	7.99	11.64	1.69
10	784	57.27	9.83	4.81	3.55	1.08
11	1674	94.16	16.26	4.36	1.48	0.71
12	4805	11.91	2.03	5.04	4.11	1.12
13	3956	20.52	3.50	6.69	14.05	1.83
14	784	29.98	5.12	6.76	2.30	1.03
15	4911	72.25	12.43	5.87	11.55	1.63
Totals:		7712.22	4885.97	91.68	99.92	22.22
*Assumed an Isp = 300 s and md = 500 kg						



Launch Date:		15-Dec-10				
#	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	4566	6916.74	4748.16	15.01	4.75	4.86
2	1409	215.30	37.96	9.84	7.79	1.92
3	4017	91.86	15.86	4.29	1.61	0.70
4	2449	113.64	19.69	1.72	4.65	0.98
5	2441	7.63	1.30	2.74	11.35	1.23
6	5189	15.18	2.59	4.80	4.64	0.94
7	3353	18.56	3.17	4.94	13.31	1.58
8	471	7.29	1.24	6.82	3.13	0.94
9	2784	39.93	6.83	7.99	11.64	1.69
10	784	57.27	9.83	4.81	3.55	1.08
11	1674	94.16	16.26	4.36	1.48	0.71
12	4805	11.91	2.03	5.04	4.11	1.12
13	3956	20.52	3.50	6.69	14.05	1.83
14	784	29.98	5.12	6.76	2.30	1.03
15	4911	72.25	12.43	5.87	11.55	1.63
Totals:		7712.22	4885.97	91.68	99.92	22.22
*Assumed an Isp = 300 s and md = 500 kg						



Launch Date:		31-Dec-10				
#	Objects	ΔV (m/s)*	Δm_p (kg)*	V_∞ (m/s)	V_{flyby} (m/s)	J-Score
1	5825	4232.55	1607.52	1.10	6.54	2.55
2	6019	30.01	5.13	9.35	17.56	2.42
3	5879	24.87	4.24	1.95	3.01	0.82
4	1454	48.43	8.30	7.99	7.25	1.45
5	5444	83.82	14.45	5.23	5.04	1.06
6	3573	54.34	9.32	6.63	7.56	1.38
7	3397	18.71	3.19	3.74	5.42	0.98
8	2090	44.04	7.54	8.36	7.21	1.33
9	1395	15.05	2.56	6.01	2.97	0.84
10	1152	21.38	3.65	10.96	2.78	1.28
11	2302	2.12	0.36	6.12	5.21	1.25
12	1088	6.37	1.08	15.51	5.41	1.81
13	4652	172.11	30.12	4.24	9.65	1.56
14	2424	185.96	32.62	7.67	5.94	1.57
15	5425	16.22	2.76	8.67	10.85	1.77
Totals:		4955.96	1732.86	103.52	102.39	22.06
*Assumed an Isp = 300 s and md = 500 kg						



Biographical Sketch

Captain Uriah J Tobey graduated from Sumner High School in Sumner, IA in 2000. He completed his Bachelor of Science degree in astronautical engineering at Embry-Riddle Aeronautical University, Daytona Beach, FL in 2005. Upon graduation, he received his commission from AFROTC Detachment 157.

His first assignment was as a Satellite Operations Engineer for the Space Development and Test Wing Space Test Squadron operating out of Schriever Air Force Base in Colorado Springs, CO. Here, he was the project manager for Air Force communication support of NASA's Space Transportation System missions and several DoD satellite R&D missions. He became a student of the department of Aeronautics and Astronautics at AFIT in September of 2008. Upon completion of his degree, he will take station at the United States Air Force Academy in Colorado Springs, CO. There he will instruct academy cadets in astronautics.

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14. ABSTRACT The Jet Propulsion Laboratory (JPL) catalog of near-Earth objects (NEOs) such as asteroids and comets contains over 6600 asteroids and 150 comets as of February of 2010. This includes over 1000 potentially hazardous asteroids, or objects with orbits that pass close enough to Earth to pose a potential impact threat. The asteroid community believes there are a significant number of objects still undiscovered, which makes finding, tracking, and calculating missions to study these objects an active area of research. This study was based on finding orbit solutions using Earth gravity assist to visit one NEO a year for 16 years with minimal characteristic velocities for a conventional impulsive thrust propulsion system. Using a user-defined launch date, the program iterates on a number of variables to populate lists of acceptable targets and outputs key mission parameters and 3D plots of the orbits involved.					
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